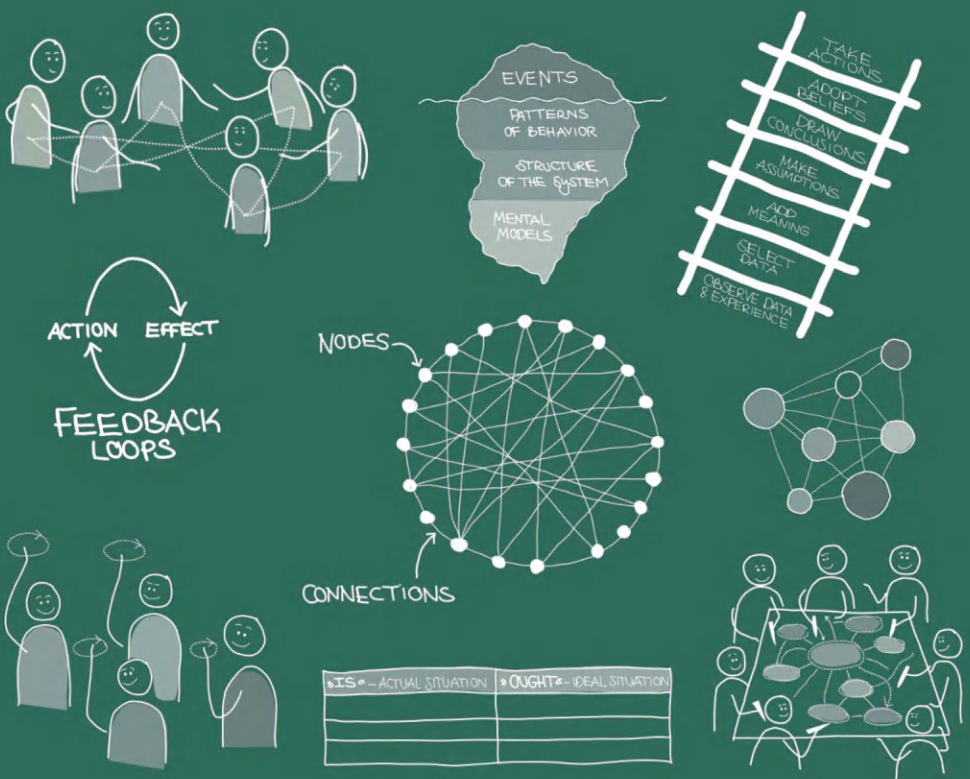
ROUTLEDGE

CHRISTIAN BARON

METHODS FOR SYSTEMS THINKING

65+ PRACTICAL APPROACHES FOR EXPLORING SYSTEMS, PERSPECTIVES, AND COMPLEXITY



"I recommend this book to you in the belief that it offers a new kind of resource for systems thinking, with many more methods than usual, which will be of real benefit to the growing number of systems practitioners who seek to mix methods creatively in response to ever more challenging social contexts."

Gerald Midgley, *Centre for Systems Studies, University of Hull*

"*Methods for Systems Thinking* makes systems thinking practical and usable in real-world contexts. It offers a clear, effective set of approaches to help you get started and make progress."

Ray Ison, *Emeritus Professor of Systems, The Open University*

"This is a great book that is worth reading and referring to again and again, both for beginners and experts. It provides both in-depth insights into systems thinking as a discipline and a wealth of different methods and their application."

Michael Frahm, *SCiO Director DACH*

"*Methods for Systems Thinking* is a practical and insightful guide for anyone who manages, leads, or facilitates groups. With clear tools and a solid primer on systems theory, it's a trusted companion for shared design, planning, and building trust. I expect to return to its pages often."

James Stauch, *Complex Systems Strategist, ATCO SpaceLab*

"This book combines excellent didactic design with clear methods and inspiring visuals. It not only sparks creativity and innovation but also equips readers to go beyond conventional problem-solving and develop transformative solutions in both academic and practical contexts. I will definitely use it in my teaching and recommend it to colleagues."

Isabell Osann, *Lecturer and Transformation Facilitator*

"A practical treasure trove that transforms systems thinking from abstract theory into actionable tools. This book bridges the gap between understanding complexity and actually working with it. Timely and accessible."

Tony Fish, *trying to ask better questions. Investor, Author and Maverick*

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Methods for Systems Thinking

Methods for Systems Thinking is a practical workbook with more than 65 methods you can apply right away. It helps you explore complex systems, involve the right people, and respond effectively to change.

The QuickStart Guide shows you where to begin. You can start with the short theory section, use the 5M Methods Matrix to choose an approach, or jump straight to a method. Methods are organized by the 5M Structure (Motivate, Meet, Map, Make, and Manage) so you can quickly find what fits your purpose, whether clarifying goals, engaging stakeholders, mapping connections, shaping responses, or adapting over time.

Each method spans three pages and gives you a description, purpose, application, illustration, and step-by-step guidance. You also get tips for facilitation, debriefing, and variations. The focus is on action, turning reflection into results.

Christian Baron, PhD, is a consultant, trainer, and systemic coach. He uses systems thinking to make complexity manageable, with a focus on clarity, collaboration, and lasting impact.

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Methods for Systems Thinking

65+ Practical Approaches
for Exploring Systems, Perspectives,
and Complexity

Christian Baron

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Foreword

Christian Baron's book points in a new direction for systems thinking resources. Let me explain with the aid of a brief reflection on systems thinking since the 1980s, including one of my own contributions, as this will make it clear why I see this book as an important new development.

Back in the early 1980s, there was a "paradigm war" (two competing understandings of what systems thinking is, underpinned by very different assumptions about the nature of reality and our knowledge of it) that threatened to tear our research community apart. Some people were concerned with enhancing objectivity, optimization, and expert analysis, while others emphasized intersubjectivity, stakeholder participation, and facilitated dialogue. Those seeking objectivity viewed systems as things we can know in the real world [1], while those facilitating intersubjectivity thought of systems as being useful interpretations (i.e., in the mind), constructed through processes of collaborative inquiry [2]. The paradigm war became entrenched, and there were almost no points of agreement between the two sides, making mutual appreciation very difficult [3].

In this context, Jackson and Keys [4] observed that, when it came to practice, the two different visions of systems thinking made fundamentally different assumptions about the nature of organizations and the relationships between stakeholders, which makes them useful in different contexts. At the risk of oversimplifying their argument, it's useful to pursue objectivity, optimization, and expert analysis when there is agreement between stakeholders on the issues being tackled. However, when there is disagreement, then stakeholder participation, dialogue, and a search for mutual understanding are more valuable. Building on this argument, Jackson [5] advocated methodological pluralism: treating different methodologies, which are grounded in the different paradigms, as complementary rather than competing.

This was a critically important contribution to systems thinking not just because it offered a way to save the systems research community from being riven in two but also because it offered a more flexible and responsive systems practice than either of the earlier versions of systems thinking. Essentially, it made clear that we can have the best of both worlds.

During the late 1980s and throughout the 1990s, over 100 authors contributed to our understanding of methodological pluralism [6] until, in the year 2000, two books consolidated contrasting understandings of what it involves. Jackson [7] emphasized the use of multiple methodologies based in four different paradigms (going beyond the original two from the early 1980s), and he argued that we can usefully switch from one methodological rationale to another – including movement between one set of philosophical assumptions about reality and our knowledge of it to a different set of assumptions. This appeared to assume there is a "neutral," meta perspective from which methodologies and paradigms can be observed and understood [6, 8]. Jackson was very clear that methods shouldn't be divorced from methodologies, as it is methodologies that provide philosophy and theory explaining why methods are valid and how they work. In contrast, I wrote a book [8] arguing that there is no "neutral" place "above" the methodologies and their paradigms from which to observe and use them: methodologies come to be interpreted through the practitioner's own paradigmatic lens, which cannot be transcended but can evolve over time through processes of learning with others. Also, I claimed that it is more useful to mix methods in practice than deploy whole methodologies, with methods being drawn from multiple methodological sources and reinterpreted by the practitioner. Thus, methods can be detached from their original methodological rationales and can be deployed in new ways, different from those that their creators intended. Indeed, I argue that whole methodologies are relatively blunt instruments: we need to be able to explore problem contexts (especially taken for granted value and boundary judgments, conflicts, and marginalization processes) to see more of the complexity than we (or a client, or any given stakeholder) might initially be aware of [9], and this most often results in the development of a bespoke intervention design, creatively mixing methods from multiple sources, as no single methodology is usually sufficient [6, 10].

Intellectually, I regard both the contributions from Jackson and myself as credible. Indeed, I recognize a significant benefit of Jackson's work [11]: by insisting on the teaching of multiple methodologies, Jackson provides an antidote to a common problem – practitioners discovering just one methodology and believing this is all systems thinking consists of. However, I argue that, when it comes to practice, mixing methods offers a great deal more flexibility and responsiveness than the use of whole methodologies, or keeping methods tied to the methodological rationales of their creators [12]. In addition, my approach doesn't say that practitioners are paradigmatically neutral, so it asks them to learn from others with different perspectives on an ongoing basis [13], thus providing another antidote to them thinking that systems thinking is just one methodology. Through ongoing learning, practitioners come to see more of their own methodological blind spots, and thereby, over time, they enhance their capabilities for exploring complexity, as well as for designing and undertaking systemic interventions in the context of that complexity.

While I have long believed that mixing methods is the most practically advantageous approach (my writings on this go back to 1989 [14]), I suggest that, in recent years, we have witnessed considerable changes in how people in organizations work that magnify the practical difference between using whole methodologies and mixing methods. Work is becoming ever more intense, with high pressure decisions needing to be made increasingly quickly [15]. Also, since the COVID-19 pandemic, working from home has become much more common [16]. Both these changes to working practices make it hard for people to find time for special projects structured by a whole systems methodology [17], and in particular, convening workshops (a practice that is often advocated in the more participative and dialogical approaches) is increasingly resisted because of the difficulty of bringing everyone together in the same place at the same time [18]. While there is undoubtedly a case for rethinking how we run our organizations [19, 20], we cannot afford to sit on our hands and wait for organizational environments to become more propitious for systems thinking; there are just too many complex and urgent issues that need tackling. If we are able and willing to detach methods from their original methodological rationales, then they can be adapted for use in new ways, for day-to-day thinking and conversation [17, 21], as well as for special projects and workshops when these are possible. This adaptation can happen without losing the idea that methods need to be understood by the practitioner in the context of his or her own evolving systems perspective.

Despite this argument for mixing methods being widely appreciated in the systems community, and despite recent changes in working practices, most contemporary, multifaceted resources for systems thinking [e.g., 11, 22–24] have continued to present systems methods in the context of whole methodologies. This is where the book you are reading is different, and it points to a new way forward.

I am not aware of another systems thinking book that presents as many methods as this one (65+), drawn from such a diversity of sources, offering the potential to be adapted for use in a multitude of situations. However, a list of methods alone would not be very useful: it would overwhelm the average reader who is approaching systems thinking for the first time. Two additional elements of this book are key:

First, Baron explains the importance of using the methods in the context of a systemic mindset: the unsystemic use of systems methods can lead to fundamental misunderstandings of systems thinking [25]. I would argue that it can do significant harm, too, as without a systemic mindset, there is nothing beyond the limited method at hand to support the practitioner in exploring boundaries, mapping relationships, appreciating different perspectives, and understanding emergent properties during interventions. These are all key systemic skills for engaging with complexity and enhancing critique and innovation, and they can be practiced even when no formal method appears to be relevant [17, 21, 26, 27].

Second, of equal value to the insistence on a systemic mindset is Baron's categorization of five broad purposes for the methods he discusses, and this structure helps to differentiate between classes of methods. It is also simple enough to be immediately understood. Of course, methods can be adapted for purposes other than those they are usually used for [28, 29], but as a starting point for learning, the emphasis on purposes is consistent with mixing methods [8] and can be readily appreciated by novice practitioners.

I recommend this book to you in the belief that it offers a new kind of resource for systems thinking, with many more methods than usual, which will be of real benefit to the growing number of systems practitioners who seek to mix methods creatively in response to ever more challenging social contexts.

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Preface

This book began with a simple intention: to make systems thinking more accessible and usable in everyday work. What you now hold in your hands is the result of years of exploration, collecting methods, testing ideas, refining practices, and learning with others.

It started with a growing set of practical tools and exercises used in facilitation, workshops, and strategy work. Over time, a structure emerged, ways to organize the tools and frame the work, that made it easier to teach, share, and apply in many different settings. The idea behind this book is that it can be a resource not just for learning about systems thinking but also for applying it directly in complex, messy situations.

This book would not exist without the support of many people.

Thank you to those closest to me: Anna, Kirsten, Rita, and Wolfgang. Thank you for your presence, encouragement, and care.

Thank you to everyone who contributed feedback, reviewed drafts, challenged ideas, or helped sharpen the clarity of the text. Your input pushed this work forward in essential ways.

A special thanks to the reviewers: Tony Fish, Michael Frahm, Isabell Osann, and James Stauch. Thank you to Gerald Midgley for contributing the foreword and to all who offered endorsements and encouragement along the way. Your questions, critique, and perspectives helped bring this to another level.

Writing this book has been both a personal and professional process. Systems thinking is not just a set of tools, it is a way of seeing, of listening, of working with uncertainty. This book reflects what I have learned so far. It is not a final answer but a contribution to an ongoing field of practice.

The process was supported by modern AI tools, used for research, synthesis, and drafting. But the heart of the work lies in dialogue, reflection, and shared learning with people.

Thank you for being part of this. May this book support your own thinking, questioning, and action in the systems you care about.

About the Author

Christian Baron, PhD, is a freelance consultant, trainer, and systemic coach. As founder of zusammen-weiterdenken, he supports clients in creating sustainable value and navigating organizational transformation. With experience in research leadership and mid-sized industry, he applies systems thinking and systemic methods to make complexity more workable. His practice focuses on clarity, collaboration, and long-term impact.

About This Book

Methods for Systems Thinking is a workbook of practical approaches to systems thinking. It brings together a wide range of frameworks, methods, tools, visuals, and activities that help users explore, understand, and intervene in real-world systems. These approaches focus on visualizing relationships, understanding change over time, fostering creative responses, and supporting collaboration across diverse perspectives.

Why This Book?

This workbook is designed for immediate use. The focus is on approaches that can be applied rather than on theoretical discussion. It offers a broad collection of hands-on techniques to explore, understand, and intervene in real-world systems – whether mapping systems, analysing dynamics, or developing solutions.

Whom for?

Methods for Systems Thinking is for educators, managers, facilitators, leaders, consultants, and others working with real-world systems. It applies across fields, such as education, healthcare, business, government, and environmental work, and extends to any area where people deal with complexity, collaboration, or change. It is also useful in academic contexts, offering students and teachers clear examples and a broad set of approaches for teaching, research, and applied learning. Whether you work within a discipline or across boundaries, these methods support systems thinking in practice.

Why Methods?

Systems thinking is not a fixed set of rules or a single approach. What counts as systemic often depends on context, purpose, and perspective. This book offers structured approaches to help explore, test, and engage with systems.

Readers are encouraged to build their own understanding and choose tools that fit their needs. These resources are not shortcuts but prompts for reflection and action. You remain the master of your own thinking. The approaches in this book support your work but do not replace your judgment.

A Note on Terms

In this book, several terms to describe different types of resources are used:

- *Frameworks* help how we see, structure, or group situations.
- *Methodologies* are theory-based approaches for selecting and combining methods.
- *Methods* are structured processes for exploring, analysing, or planning.
- *Tools* are techniques that support a method or framework.
- *Visualizations* show patterns or connections, often as diagrams.
- *Activities* put these into practice, often in groups or workshops.

QuickStart Guide

Two Ways to Start

This book introduces key ideas in systems and systems thinking, followed by 65+ practical approaches organized using the 5M Structure. You can either start with the fundamentals or go straight to the methods.

- *Want context first? Part 1* covers what systems are, what systems thinking is, and how to become a systems thinker.
- *Ready to get hands-on? Parts 2 and 3* include practical tools, grouped in the 5M Structure.

The 5M Structure – Overview

Focus Area	What it helps with
Motivate	Clarify purpose and need for action
Meet	Engage stakeholders and perspectives
Map	Understand and visualize the system
Make	Take action and create solutions
Manage	Evaluate and adapt over time

Find Your Starting Point

Your Situation	Start with
You need to clarify purpose and direction	Motivate
You need to involve key people or perspectives	Meet
The system feels unclear or overwhelming	Map
You need to design and build possible solutions	Make
You need to evaluate, learn, or adapt over time	Manage

How the Methods Work

Each method in *Part 3* includes the following:

- Purpose, applications, and typical use cases
- Step-by-step instructions
- Tips for facilitators, debriefing, and variations

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Introduction

Many of today's world challenges have to do with systems – where multiple parts connect, interact, and change together. Climate change, economic shifts, or health crises don't happen in isolation. They are part of something bigger. They are part of interconnected systems. When a part changes, other parts respond. Because of these interrelations, simple fixes often fail – or make things worse.

Systems thinking can support work with these kinds of challenges. Instead of looking at isolated pieces, it encourages us to step back and understand how parts fit together. This helps us understand better how problems arise and where lasting solutions might come from.

This book is intended to support readers to apply systems thinking in practice. It offers simple, practical methods, simulations, exercises, and frameworks to explore, understand, and intervene in real-world systems. Systems thinking helps reveal patterns, feedback loops, and unintended effects. Rather than chasing symptoms, it encourages us to address deeper causes and design solutions that remain effective as situations evolve.

From education to urban planning, business, healthcare, or environmental management – many fields face systems where multiple factors interact. Though contexts differ, systems thinking offers shared principles to work with complexity and change.

At its core, systems thinking shifts how we see problems. When we change our perspective, new possibilities emerge – often in unexpected places. This change in perspective helps us work with difficult problems, adapt as conditions change, and build solutions that last.

The following chapters introduce the basics of systems and systems thinking, followed by a wide range of practical methods. Whether you need to map connections, address difficult problems, or plan for the future, these tools aim to make systems thinking practical and actionable.

This is a book for practice. I hope you find these methods helpful as you work with your systems challenges.

Now, let's begin.

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Part 1

Systems and Systems Thinking

Many tricky problems involve systems where parts connect, interact, and shift together.

In this part, I introduce how systems thinking helps frame such problems more effectively. Systems in nature, technology, and society display layers of relationships that produce outcomes we cannot predict by analysing parts in isolation.

Together, we explore how systems thinking shifts our framing of problems to see beyond isolated issues toward larger patterns and interactions that shape the world. This chapter sets the foundation for understanding how systems thinking supports better analysis, design, and decision-making when working with systems.

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Understand Systems

What do a tree, a weather system, and a company have in common? They're all systems but not of the same kind.

A useful first step in understanding systems is to group them into two broad types:

- *Natural systems*, like ecosystems, weather patterns, or the solar system, form and function without human design.
- *Human-made systems*, like companies, hospitals, or machines, are intentionally designed to serve specific goals.

How we describe a system depends on which type we're looking at. Human-made systems usually have clear roles, boundaries, and objectives. Natural systems show structure and interaction without designed intention.

One often-cited general definition aiming at broad applicability across many domains comes from von Bertalanffy [30]:

> "A system can be defined as a complex of interacting elements."

This is a minimal definition. It focuses on elements and the interactions between them, regardless of origin or design. In human-made and social systems, however, these elements are typically organized to serve a purpose or achieve specific goals [31, 32].

Depending on the context, systems are often described by the domain they operate in: for example, biological systems (like organisms), technical systems (like machines), or social systems (like institutions). These categories help us focus on the kinds of interactions and components that matter most in each case.

Across most domains, systems typically share a few core traits that help define them, especially in human-made systems:

- *Purpose (when present):* The system's reason for existing.
- *Components:* The individual parts or elements that form the system.

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- *Interdependence:* Relationships and interactions between the components.
- *Boundaries:* Limits that define what is inside and outside of the system.
- *Environment:* External factors influencing and being influenced by the system.

One trait that often causes confusion and is often misunderstood is *purpose*. It's not the same as a goal. A goal is a specific, short-term outcome a system might try to achieve, like reducing wait times or increasing output. Purpose is broader, it refers to the system's ongoing role or function over time. In human-made systems, purpose is often defined by design. In natural systems, purpose doesn't apply in the intentional sense because these systems aren't created with goals; they simply function.

Let's look at how this plays out in practice. Take a hospital, for example.

A hospital might set a goal of reducing patient wait times, but its actual *purpose* is reflected in what it consistently does. If its behaviour prioritizes revenue over patient care, then – regardless of stated goals – its effective purpose may be financial gain rather than community health [33].

The other traits of the system are often easier to observe:

- *Components* include doctors, nurses, equipment, and facilities.
- *Interdependence* describes how these parts interact, for example, nurses monitor patients and provide information that doctors use to make decisions.
- *Boundaries* define what belongs to the system (staff, patients, buildings) and what doesn't (insurance providers, external suppliers).
- *Environment* includes healthcare policies, public funding, and disease trends, all factors that shape how the hospital operates [32].

This example shows how each trait plays out in a real system and how *purpose* isn't always stated but is revealed by how the system operates in practice. It also highlights that understanding a system isn't just about listing parts. What matters is how those parts interact, how the system responds to its environment, and how its behaviour aligns (or doesn't) with its stated goals.

This view is central to general systems theory: a system is defined not just by its components but by how those components interact as well. Ross Ashby, Donella Meadows, and Peter Checkland each emphasized that it's the relationships and patterns of interaction that make a system. Without them, there may be no system at all, just a collection of elements [32–34].

Take the human heart: It doesn't work in isolation. It depends on signals from the brain, oxygen from the lungs, and coordination with other organs. Its function only makes sense within the full body. Or consider an orchestra: individual instruments make sounds, but only their interplay produces music.

Another illustrative example is the Matryoshka doll:

- *Purpose:* It serves as a decorative item representing unity.
- *Components:* A set of nested dolls of decreasing size.
- *Interdependence:* Each doll relies on the others to form a complete set.
- *Boundaries:* The outermost doll defines the system's boundary.
- *Environment:* Includes how the dolls are displayed and their cultural significance.

This example highlights how interconnected parts within a system contribute to a greater purpose, underscoring the value of understanding systems as a whole [32].

But Not Everyone Sees the Same System

What we call a system depends not just on what's physically there but on how we choose to look at it. As Ross Ashby [34] noted, any physical object – like a pendulum, a village, or a hospital – has countless variables. Which ones we focus on depends on our purpose.

This aligns with ideas from radical constructivism, as proposed by Ernst von Glasersfeld and Heinz von Foerster, which emphasize that knowledge, and system boundaries, are constructed by the observer, not simply found in the world [35, 36]. We don't study "everything." Instead, we define a system by focusing on the elements and relationships that matter for the issue at hand.

Take a car, for example. Is it one system or many? That depends. If you're thinking about transportation, the engine, wheels, and steering might be central. If you're interested in climate control, the air conditioning system becomes relevant.

What counts as the system changes depending on what you're trying to understand or influence.

Let's take another example – a car repair shop:

- *For a customer*, the system seems simple: you bring your car, they fix it, and you pick it up. The customer focuses on the service outcome.
- *For a mechanic*, the system includes diagnostics, repair procedures, parts ordering, safety standards, and technical skills. What matters is finding and solving the technical problem.
- *For the shop manager*, the system is broader: staff schedules, finances, inventory, customer satisfaction, supplier contracts, and legal compliance all become relevant.
- *For someone developing management software* for repair shops, the system breaks down into subsystems: appointment scheduling, billing, parts inventory, customer databases, and reporting tools.

In each case, the same physical place is viewed as a different system depending on the observer's role, purpose, and knowledge. The system boundary shifts based on what questions are being asked.

But even once we've drawn a boundary, not all systems behave the same. They differ in how they respond to their environment, deal with change, or evolve over time.

To make sense of this variety, we tend to put things into mental boxes. It's how we explain our view of the world – by grouping things that seem similar. For systems, this means using categories or classifications. We group systems to spot patterns, highlight important differences, and choose better ways of working with them [37]. Without some kind of structure, we'd have to start from scratch every time we faced a new system. That's why it makes sense to begin with the basics – the common ways systems are understood and classified.

Even though every system depends on how we define it, certain recurring patterns help us work with systems more effectively. Classifications and categories give us a starting point for selecting appropriate methods and tools.

System Classification

There is a broad variety of systems. Some we call simple and predictable, like a light switch. Others are seen as dynamic and ever-changing, like the weather. Classifying systems helps us make sense of their diversity by organizing them into categories based on key characteristics [38].

There are many ways to classify systems, depending on the field or purpose. In classical systems theory, systems are seen as bounded, analysable, and made up of interacting parts with clear boundaries and purpose. In complexity science and ecology, Jean Boulton [39] describes systems as ongoing processes rather than fixed structures. She emphasizes flow, emergence, and the role of context. In economics, J. Doyne Farmer [40] shows that economies behave as complex systems that are nonlinear, uncertain, and shaped by the interaction of adaptive agents rather than by fixed rules.

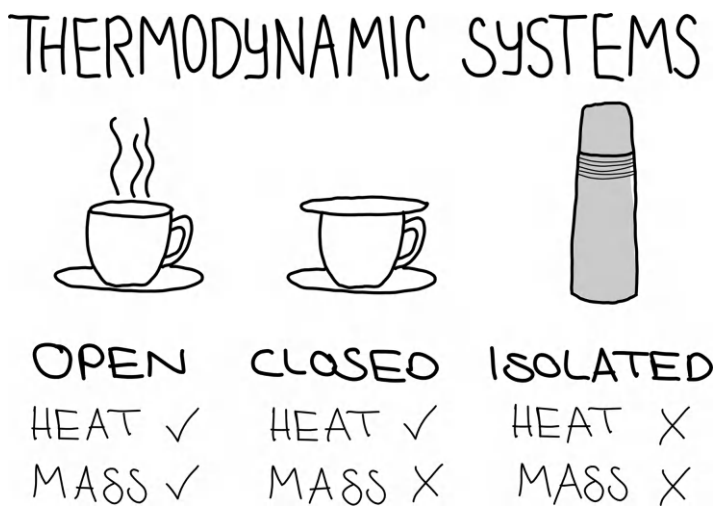
To ground these ideas, we begin with one of the most accessible approaches: structural classification.

A Textbook Example

Textbooks often illustrate structural classification with a simple example: how systems interact with their environment and whether they are open, closed, or isolated. This framework, originally developed in thermodynamics, is often the starting point in system studies because it deals with observable boundaries and flows, making it useful for identifying what goes in, what comes out, and what stays contained.

This structural view divides systems into three types:

- *Open Systems* exchange matter, energy, or information with their environment. These interactions make them adaptable and responsive. In social or ecological contexts, their boundaries are often conceptual rather than physical. Examples include the human body and ecosystems [30], businesses and social systems [32], or simple physical examples like refrigerators, frying pans, or a cup of coffee, often used in systems teaching.
- *Closed Systems* exchange energy but not matter with their surroundings. Examples include a sealed water bottle, where heat passes through but water remains inside, or a pressure cooker, which transfers heat while retaining contents or a coffee cup with a lid [32].
- *Isolated Systems* neither exchange matter nor energy with their surroundings. While theoretical in nature, examples include a well-insulated thermos, effective only for a short time before heat escapes, or experimental setups in physics designed to minimize all external interactions, or the universe as a whole [41].



The structural view is only one way of classifying systems. To capture a broader range of patterns, researchers also distinguish systems by their behaviour, complexity, adaptability, and hierarchy. Together, these five categories help identify key features, guide strategy, and show how systems interact with their environment [32].

Five Key Classifications

What counts as a system, and how it should be framed, depends on the field. Still, the following classifications offer a useful starting point in many practical contexts:

1. *Structural:* How systems interact with their environment (e.g., open, closed, or isolated) [34].
2. *Behavioural:* How systems change over time (e.g., static, dynamic, linear, or nonlinear) [42].
3. *Complexity-Based:* How interconnected and predictable they are (e.g., simple, complicated, complex, or chaotic) [37, 43].
4. *Adaptability:* How systems respond to disruptions (e.g., resilient or adaptive) [44].
5. *Hierarchy:* How systems are organized (e.g., hierarchical or flat) [30, 38].

These categories help us make sense of systems in theory. In practice, however, most systems don't fit neatly into a single category.

Real-World Systems

In theory, systems can be neatly classified – as open or closed, simple or structured, hierarchical or flat. These categories offer useful ways to study and describe them.

In practice, however, the systems encountered in everyday life rarely fit neatly into a single category. Those *"real-world systems"* don't stay inside neat boxes. Their behaviour shifts depending on the situation, and many systems show features from more than one category at once [44, 45].

Most systems we deal with are nonlinear and difficult to predict. They involve many parts that interact in often unexpected ways, with feedback loops and ongoing change.

Real systems rarely fit simple textbook definitions. Their behaviour depends not just on the parts they contain but on how those parts interact and adapt as well [32, 33].

Even supposedly "closed" systems, such as a thermos or a pressure cooker, still interact with their surroundings, showing that system boundaries are not fixed but depend on our point of view.

As Donella Meadows [33] puts it:

> "There are no separate systems. The world is a continuum. Where to draw a boundary around a system depends on the purpose of the discussion."

This perspective leads to three important insights:

- Systems are rarely fully isolated.
- Boundaries are defined by the observer and depend on context.
- Elements within and across systems are interconnected.

In light of this, it's more useful to see systems not as fixed structures but as evolving patterns, shaped by feedback and outside influence. Systems that behave this way often show features like openness, emergence, self-organization, and change. These are typical of what complexity science calls *complex systems*: systems made up of many parts that interact in ways we can't predict by looking at the parts alone. Examples include ecosystems, economies, cities, and social networks.

To capture how some of these systems change and learn over time, researchers use the concept of complex adaptive systems (CAS). This framing highlights systems that adjust continuously, with behaviour that emerges from many small interactions and shifts as conditions change [46–48].

Real-world systems don't always fit neatly into this category, but the idea points to traits that are often useful when describing them. The following table shows examples and the kinds of patterns that are often observed in practice:

System	*Key Classifications*	*Description*
Human Body	Open, dynamic, complex, adaptive, hierarchical	Subsystems like circulatory and nervous systems work together, adapting to maintain homeostasis.
Cities	Open, dynamic, complex, adaptive, hierarchical	Interconnected infrastructure (e.g., transport, utilities) adapts to growth, crises, and disruptions.
Healthcare Systems	Open, dynamic, complex, adaptive, hierarchical	Hospitals and policymakers coordinate to address care and crises like pandemics.
Ecosystems (Forests)	Open, dynamic, nonlinear, complex, adaptive	Forests show resilience through feedback loops (e.g., regrowth after wildfires) and interdependencies.
Global Supply Chains	Open, complicated or complex, adaptive, hierarchical	Systems of suppliers and manufacturers adapt to global disruptions like COVID-19.
Social Media	Open, chaotic, adaptive, often flat	Viral content spreads unpredictably, with emergent patterns driven by user interactions.

Even though these examples show useful patterns, most systems rarely remain fully stable. Their behaviour can change over time, and many display different characteristics depending on scale, timeframe, or perspective. The same system may appear simple, complicated, or complex depending on which part is observed or which question is being asked.

That's why classifications are only a starting point. To work with real-world systems – especially under conditions of uncertainty, novelty, or unpredictability – we need practical approaches that support us understand how systems behave in specific situations.

The next section introduces ways to make systems more visible, more tangible, and more workable.

Making Systems Tangible

Knowing that real-world systems may be complex, adaptive, and unpredictable is important, but it's not enough. To work with them in practice, methods (a set of steps you follow to do something) can turn abstract understanding into concrete action. These methods support efforts to make systems more tangible, not just by naming structures or patterns but also by making them easier to see, map, and work with. They help reveal where connections form, how feedback loops work, and where small changes might matter, even in messy or uncertain systems.

For example, in dynamic systems, behaviour unfolds over time and is often shaped by delays and feedback loops. Tools such as Causal Loop Diagrams help map these cause-and-effect patterns. Methods like Leverage Point Mapping show where small changes might lead to big effects. Frameworks such as Systems Archetypes, the Iceberg Model, and Cynefin are intended to assist in making sense of system behaviour and help select suitable actions [33, 49].

Recognizing that a system is possibly complex also means accepting its unpredictability. Methods like Scenario Planning [50], Morphological Analysis [51], and visualizations, such as the Futures Wheel [47], help explore possible developments and ripple effects. These methods don't offer control, but they help us prepare for change and uncertainty.

Some methods also make abstract system categories easier to grasp. For instance, terms like "open systems" or "resilient systems" can feel vague until paired with methods such as stakeholder mapping, causal loop diagrams, or rich pictures. These methods help bridge the gap between general ideas and practical engagement, making it easier to apply systems thinking in the real world [32, 33, 52].

Turning Toward Action

While many systems share similar core traits (see: "Understand Systems"), not all need the same attention or effort to manage. Supposedly simple systems, like light switches or mechanical levers, seem predictable and easy to handle.

But most real-world challenges, such as climate change, financial instability, or organizational change, take place within systems that are interconnected, adaptive, and often unpredictable [37].

Recognizing their supposedly complex nature isn't enough. Without the right approaches, even getting started can feel overwhelming. That's why practical methods are essential: they help bridge understanding and action, linking what we know about a system with what we can actually do [52].

Systems thinking, when paired with the right approaches, helps us to do the following:

- *Reveal hidden patterns and relationships*: Spot trends and connections that aren't obvious [33].
- *Find leverage points for real change:* Identify where small shifts can make a big difference [33].
- *Deal with uncertainty and adapt as things change:* Stay flexible and adjust to new conditions [44].

After looking at how classifications, methods, and tools help us engage with systems, we now turn to the mindset that ties it all together. Tools and methods matter, but how we frame, interpret, and act on what we see matters just as much. Systems thinking gives us that lens: it helps reveal structure and patterns and helps us reflect on our role within the system.

Understand Systems Thinking

There are many ways of thinking. At its core, thinking is the mental process of making sense of information, forming judgments, and guiding actions. Some kinds of thinking focus on quick fixes. Others step back and look at patterns. Some try to break things into parts. Others look at how things connect. Not all types of thinking work well in every situation. When we're dealing with something that changes over time, has many moving parts, or doesn't respond to simple fixes, a more connected kind of thinking is needed.

That's where systems thinking comes in.

Systems thinking is often described in broad or holistic terms, but those phrases can be vague and do not explain how systems actually behave. One simple way of putting it is that systems thinking is "thinking about systems." More accurately, systems thinking focuses on how systems generate behaviour through the interactions of their components [33, 52, 53] or, in the case of social systems, through ongoing communication processes that reproduce the system itself [54].

Brief History

Most published histories of systems thinking focus on academic and institutional developments in Europe and North America. As a result, they often foreground modern, formalized approaches while overlooking cultural and indigenous traditions that have long emphasized connection, balance, and interdependence, even if not described using systems language. While these broader traditions exist, the historical development of systems thinking in academic literature is usually traced as follows:

Over time, different people and schools of thought have shaped how systems thinking is used and understood. It is often described that this development has happened in waves, with each wave adding new ideas and tools for addressing connected problems [8, 22, 55]. The wave metaphor offers a useful overview but simplifies a more complex development. In practice, many of these approaches have evolved in parallel, overlap, and continue to influence each other. There are also different ways of defining the waves, depending on which traditions and frameworks are emphasized.

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The first wave (hard systems thinking) focused on structured, goal-oriented problem-solving, modelling, and control, often using formal models to analyse interrelationships between system components. One of the earliest contributions came from Russian thinker Alexander Bogdanov, who developed *Tektology* (1910–1913) – a general science of organization [56]. He argued that social and organizational systems should reflect natural systems, or they would fail. Although his work was later suppressed in the Soviet Union, it laid important conceptual groundwork for later systems theories.

This early interest in wholes and interconnection re-emerged in the West. In the 1940s and 1950s, the development of cybernetics by Norbert Wiener [57] and W. Ross Ashby [34] introduced key ideas like feedback, control, and communication – particularly in the context of machines and biological systems. Around the same time, Kenneth Boulding's paper "General Systems Theory – The Skeleton of Science" [58] applied systems thinking to economics and social science. Later, Ludwig von Bertalanffy's *General System Theory (1968) [30]* offered a broad conceptual framing of how systems work. It proposed that systems show properties that cannot be understood by analysing their components separately. This laid the groundwork for interdisciplinary systems thinking, emphasizing the importance of understanding wholes, patterns, and structures.

During this period, systems thinking was strongly linked to intervention and practical problem-solving, often through structured modelling approaches such as system dynamics [59, 60] and the viable system model [61, 62]. The goal was to optimize performance or improve planning through rational, often expert-driven methods.

The second wave (soft systems thinking) introduced the importance of perspectives. As the limits of purely technical and control-based approaches became clear, attention shifted in the 1970s and 1980s to the role of human viewpoints, interpretation, and learning. Many real-world problems were recognized as ill-structured or "messy," involving multiple stakeholders with different goals and worldviews.

Soft Systems Methodology [32] provided a structured way to explore these different perspectives and support learning in situations where problems cannot be clearly defined in advance. Similarly, Strategic Assumption Surfacing and Testing [63] offered ways to uncover and examine the assumptions behind competing positions. The focus moved from prediction and optimization toward negotiation, participation, and collaborative sense-making, emphasizing that understanding complex situations often requires dialogue, not just technical expertise.

The third wave (critical systems thinking) introduced critical reflection on power, values, and ethics in system interventions. It emphasized that systems are not neutral or purely technical but involve decisions about boundaries, inclusion, and exclusion [8, 22]. Interpretive and constructivist approaches [64, 65] stressed that systems are shaped by the observer's purpose, interests, and cultural context. Rather than assuming that system boundaries are fixed, critical systems thinking views boundaries as choices that reflect particular perspectives and serve particular interests.

Critical Systems Heuristics [22] provided a structured way to examine whose interests are being represented, which voices are included or excluded, and how power relations shape system designs. This wave shifted attention from technical solutions to issues of fairness, legitimacy, and emancipation, encouraging practitioners to reflect on the broader social and ethical consequences of system interventions.

The fourth wave (complexity and adaptive systems) addresses systems that are dynamic, nonlinear, and unpredictable. Complexity science [46, 48, 66] explores how large numbers of interacting elements produce emergent behaviour that cannot be explained by analysing parts in isolation. Concepts such as self-organization, adaptation, and emergence are central to this view. Complex adaptive systems (CAS) are characterized by ongoing change, distributed control, and sensitivity to initial conditions. While this perspective is widely adopted, some thinkers instead emphasize universal structures of systems thinking, highlighting frameworks such as DSRP [27]. Alongside this work, new ideas about living and social systems also took shape, such as the concept of autopoiesis. Autopoiesis [67] describes systems as self-producing entities that maintain themselves through internal processes rather than external control. Niklas Luhmann [54] applied autopoiesis to social systems, arguing that they reproduce themselves through communication, constructing their own meaning rather than simply reacting to their environment.

Today's systems thinking has become a mix of approaches, shaped by fields as different as neuroscience, complexity science, social theory, and consciousness studies. These fields use systems terms but often in different ways.

Concepts like meaning, perception, ethics, and emergence have moved to the foreground, replacing earlier emphasis on control and prediction. The field is shifting away from managing systems from the outside and toward acting wisely within them. The real challenge now is practical and ethical: how to respond with awareness, care, and adaptability in complex, uncertain situations, where people have different values [39, 49, 68].

Two Strands

Systems thinking has developed across a wide range of disciplines and traditions. Within this diversity, two main strands can be distinguished:

- *Theoretical systems thinking*, which focuses on understanding what systems are and how they work. This includes describing system elements, relationships, boundaries, and purposes – the basic building blocks of systems theory. It draws on formal models, abstract concepts, and general principles that help frame complex situations. This strand is sometimes described as *conceptual*, *ontological*, or *thinking about systems* and includes work by foundational thinkers such as Ashby, von Bertalanffy, Checkland, Churchman, and Luhmann [30, 34, 38, 54, 64, 69].

- *Applied systems thinking*, which focuses on how systems concepts can be used in practice – to support learning, diagnosis, planning, or intervention in complex, real-world contexts. It includes methods such as causal loop diagrams, soft systems methodology, and critical systems heuristics. This strand is often referred to as *practical*, *methodological*, or *thinking with systems*, drawing on the work of Checkland, Ison, Meadows, Midgley, and Hoverstadt [8, 33, 62, 64, 70].

This book follows the applied strand of systems thinking. It builds on the work of practitioners such as Forrester, Meadows, Midgley, Senge, and Sterman [8, 33, 52, 59, 71], who, among other things, developed approaches to support decision-making, facilitation, and systems-based inquiry.

At the same time, insights from the theoretical strand help us understand the assumptions behind these tools. Thinkers like Maturana and Varela (autopoiesis), Prigogine (self-organization), and Haken (synergetics) have shaped how we conceptualize systems in fields such as biology, sociology, and complexity science. While their contributions are foundational, they are not always directly aimed at application or intervention [42, 67, 72].

By making this distinction clear, the book supports readers move between theory and practice – using systems ideas not only to act in the world but also to reflect on how systems are seen, framed, and understood. It encourages practitioners to remain aware of how their own framing shapes what they notice, prioritize, and do in complex situations.

9 Core Concepts of Systems Thinking

Having clarified the historical and theoretical foundations, we now turn to the practical building blocks of systems thinking – concepts that help us understand, engage with, and influence systems in applied settings.

Systems thinking offers a way to look beyond events and linear cause-and-effect. Instead, it focuses on the patterns, structures, and mental models that shape system behaviour over time [71].

There are many ways to approach systems thinking, and different disciplines may emphasize different approaches or ideas. The concepts discussed here are among the most widely used across fields and offer a common foundation for applied work. They're not the only valid approach, but they provide a strong starting point for practice.

Concepts such as interconnectedness, feedback loops, stocks and flows, delays, nonlinearity, emergence, boundaries, perspectives, and leverage points give us practical tools for mapping systems, identifying points of intervention, and reflecting on how our framing shapes what we notice and act on. These ideas help shift the focus from isolated problems to the relationships and interdependencies that shape real-world outcomes [33].

With a foundational understanding of systems as mental constructs, we can now explore these core concepts in more detail. Feedback loops show how systems self-regulate or reinforce change. Stocks and flows represent how things build up or move over time. Delays and nonlinearity highlight how timing and scale matter. Emergence describes patterns that arise from interaction. Leverage points help identify where small changes might make the biggest difference. And boundaries and perspectives remind us that how we see the system shapes how we engage with it.

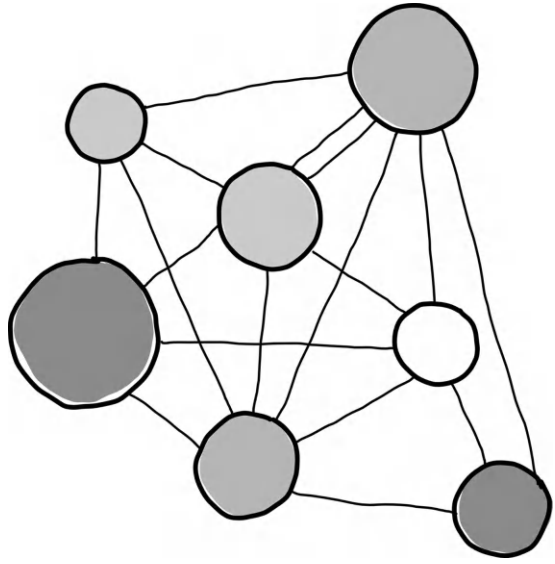
Now, we look at the core concepts in detail:

Interconnectedness

Interconnectedness describes how all parts of a system are linked, often in ways that are not immediately visible. No part functions in isolation. The behaviour of any individual element depends on its relationships with other elements [33]. This network of connections gives rise to the system's overall behaviour.

In practical terms, this means that a change in one area can lead to effects elsewhere – sometimes expected, sometimes not. For instance, in urban planning, investing in bike lanes might reduce car traffic, which then lowers air pollution, improves public health, and even affects housing demand along those routes. These chain reactions often cross traditional boundaries between sectors or domains.

Failing to consider interconnectedness can lead to short-term fixes that create long-term problems elsewhere. Systems thinking helps us zoom out, identify those connections, and understand how actions in one part of the system can ripple across others.



The following examples show how changes in one part of a system can trigger effects elsewhere.

Examples

- *Building more* bike lanes may reduce car use, which lowers pollution, improves public health, and increases housing demand near bike-friendly areas.
- *In agriculture*, using chemical fertilizers might boost crop yields short-term but over time can degrade soil, reduce biodiversity, and contaminate water sources.
- *Cutting school budgets* could save money now but might later lead to higher dropout rates, reduced job readiness, and long-term economic costs.

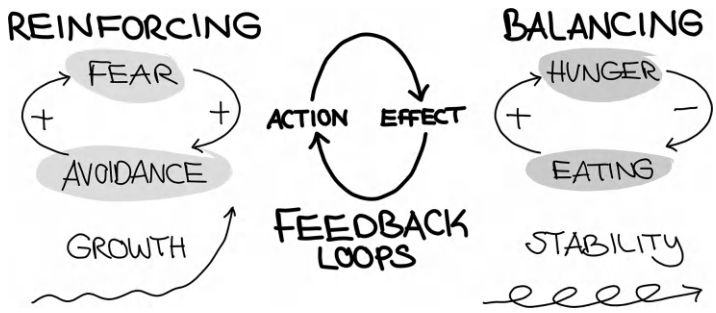
Feedback Loops

Feedback loops describe how parts of a system influence each other through circular cause-and-effect relationships. These loops can either reinforce change or balance it out over time. Understanding them helps explain why systems grow, adapt, stabilize, or spiral out of control [33, 71].

There are two main types:

- *Reinforcing loops* (also called positive feedback) amplify change. Each action pushes the system further in the same direction. These loops are behind patterns like exponential growth or collapse.
- *Balancing loops* (negative feedback) work in the opposite way: they push back against change to help maintain stability or reach a goal. They're responsible for regulation and self-correction in systems.

Not all feedback is obvious or controllable. Some loops are easy to model (like thermostats), as in control systems, while others (like team motivation) involve delays, uncertainty, or effects we only see over time. In social and complex systems, feedback may not follow strict or fully predictable patterns. This can lead to delays, hidden effects, or unintended consequences, especially when multiple loops interact.



The following examples illustrate how reinforcing and balancing loops affect system behaviour over time.

Examples

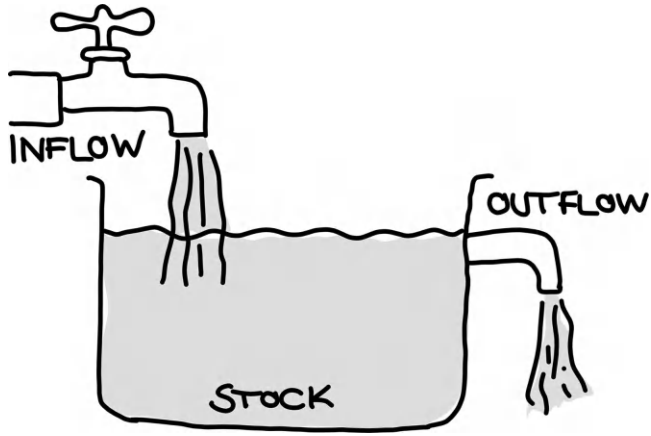
- *Population growth* is driven by a reinforcing loop: more people lead to more births, which increases the population, which then leads to even more births.
- *A thermostat* is part of a balancing loop: when the room temperature drops below the set point, the heating turns on; once the target temperature is reached, it turns off again. This keeps the system stable.
- *Team motivation* can be shaped by a reinforcing loop: reaching goals boosts morale, which increases motivation, making further success more likely.

Stocks and Flows

Stocks and flows help us understand how parts of a system grow or shrink over time – and how those parts interact [71].

- A *stock* is something that accumulates or depletes. It represents a quantity at a specific moment and tends to change gradually.
- A *flow* is what changes the stock – either adding to it (*inflow*) or reducing it (*outflow*) [33]. These two elements shape system behaviour over time.

By observing how stocks and flows behave, we can identify what drives change in a system and where interventions might be most effective. These relationships are often visualized in stock-and-flow diagrams, where stocks are shown as boxes and flows as arrows to reveal the system's structure.



The following examples show how resources build up, drain, or shift within a system.

Examples

- *Water in a reservoir* is a stock: rain and river inflow increase it; evaporation or usage decreases it.
- *Money in a bank* account is a stock: deposits add to it; withdrawals reduce it.
- *The number of people* in a city is a stock: births and migration increase it; deaths and emigration reduce it.
- *Traffic congestion* is a stock of cars on the road: cars entering add to congestion; cars exiting reduce it.

Delays

Delays refer to the time gaps between an action and its visible effect in a system. These delays are common in both physical and social systems, and they often lead to confusion, misinterpretation, or overreactions [71].

When delays are not recognized, people may assume their actions have no effect or the "wrong" effect. This can lead to policies being reversed too soon or to actions that overshoot the goal. In systems with strong feedback loops, delays can even cause instability or oscillations, where responses come too late and overcorrect.

Understanding delays helps us make more thoughtful decisions. It encourages patience when needed and helps avoid reacting to short-term symptoms rather than long-term trends. Recognizing delays also supports to explain why systems don't always respond immediately or predictably to interventions.

The following examples highlight how delayed responses can affect how we interpret and respond to change.

Examples

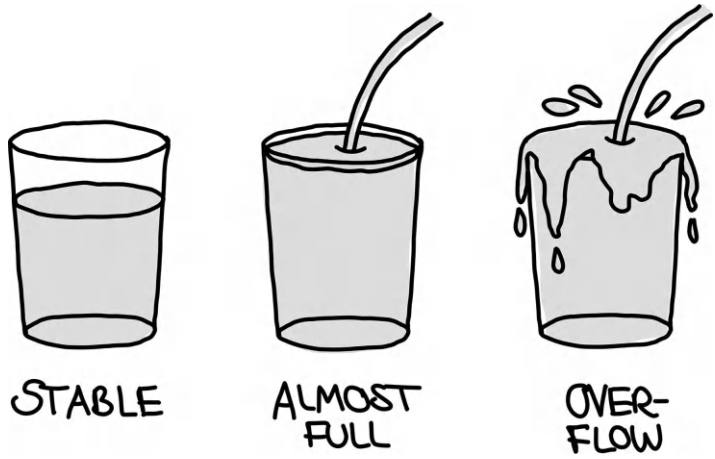
- *A government* increases healthcare funding, but improvements in health outcomes may take years to appear. Reversing the policy too soon could undo long-term gains.
- *Greenhouse gas emissions* released today may not cause visible climate effects for decades, making it difficult to generate urgency in the present.
- *A company* responds to falling sales with aggressive marketing, but due to delayed customer response, it overcompensates and floods the market.
- *In supply chains,* production adjustments take time to impact inventory, often leading to cycles of over- and understocking.

Nonlinearity

Nonlinearity means that cause and effect in systems are not always proportional. A small change might have no visible effect, or it might push the system into a new state with very different behaviour. The outcome depends on timing, context, and how close the system is to a threshold or tipping point [33].

This makes systems more difficult to predict and manage. Nonlinearity challenges the assumption that a certain level of input will always produce a matching level of output. It shows that context, thresholds, and feedback matter just as much as the action itself. In practice, this means that even well-intentioned interventions can have minimal effect or trigger major, unintended shifts.

Understanding nonlinearity helps decision-makers avoid oversimplified thinking and consider how systems might respond in unexpected ways as conditions change.



The following examples show how outcomes don't always scale with inputs; small actions may have big or no effects.

Examples

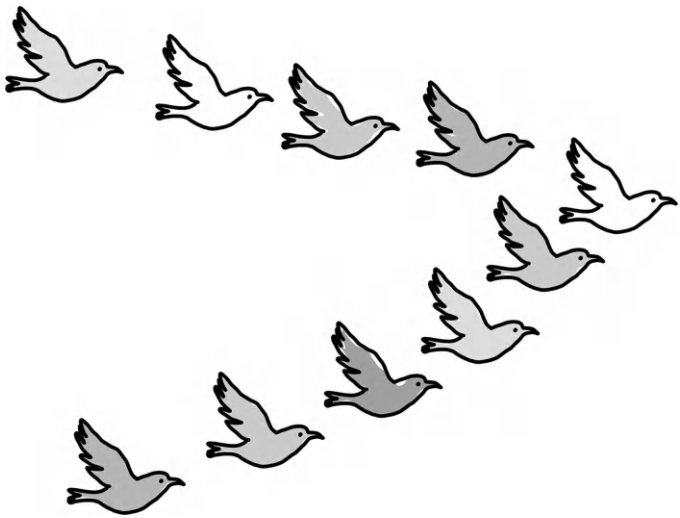
- A small *increase in pollution* may have no visible effect – until it crosses a threshold that causes rapid species collapse in an ecosystem.
- *Reducing wait times* in a customer service setting might have little impact – unless the system is already under strain, in which case even a small improvement could shift public perception dramatically.
- A minor *policy adjustment* might go unnoticed in a stable economy, but in a fragile one, it could trigger significant market volatility.
- *In education*, small class size reductions may have limited effects – until they reach a point where teacher-student interaction quality shifts significantly.

Emergence

Emergence describes how patterns, behaviours, or properties arise from the interaction of simpler elements – without any single part containing or controlling the whole outcome [32]. This means that a system can display qualities that none of its parts have in isolation.

Emergence is often hard to spot because it can look like there's a central cause, even when there isn't. The system's behaviour "emerges" from how parts relate to each other. Studying components individually can miss what only becomes visible when everything interacts as a whole.

This concept is widely used in fields like biology, sociology, and artificial intelligence. In systems thinking, emergence explains why interventions at the component level don't always work and why system-wide behaviours can seem unpredictable. It reminds us to focus on structure, interaction, and context, not just individual parts.



The following examples illustrate how simple interactions can lead to surprising system-level patterns.

Examples

- *Consciousness* is not found in a single neuron but emerges from the interactions of billions of them.
- *Market trends* are not caused by one decision-maker but by the combined behaviour of many individuals responding to shared signals.
- *Traffic patterns* don't come from one driver but emerge from the timing, spacing, and flow of many vehicles interacting at once.
- *A bird flock* moves as a coordinated group, but no single bird is in charge. The collective behaviour comes from local rules followed by each bird.

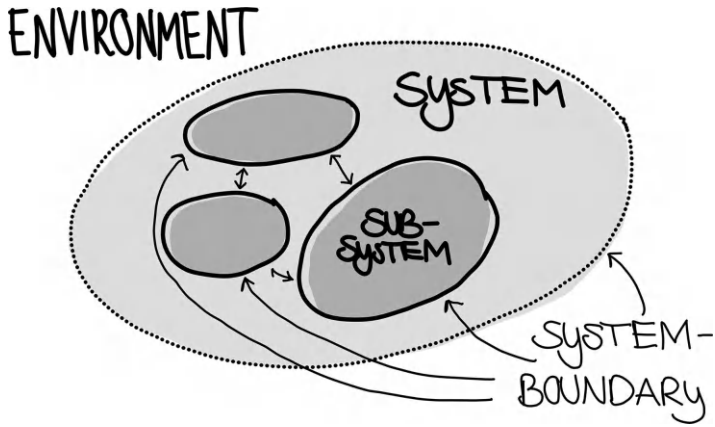
Boundaries

Boundaries define what is included and excluded when we analyse a system. They are not fixed but shaped by the perspective of the person or group doing the analysis [8]. Different stakeholders may see the same system in very different ways, depending on their values, interests, roles, and experiences.

At the same time, boundaries are also shaped by practical limits, by what we can observe, measure, or model. In complex systems, we often simplify by drawing boundaries that make the system easier to study or manage. But these choices also come with trade-offs.

Because of this, boundaries are not just technical, they are also political. Whoever defines the system's boundaries also defines what counts as relevant, what gets attention, and what is left out. These choices influence how problems are framed and which solutions are seen as legitimate.

In systems thinking, questioning and adjusting boundaries is a key part of making sure different viewpoints are considered. It helps reveal blind spots and opens up space for more inclusive, thoughtful interventions.



The following examples show how defining what's inside or outside a system affects how we understand and work with it.

Examples

- *A city's transport system* may be seen by a commuter as roads and transit routes, by an ecologist as a source of emissions, and by a policymaker as an infrastructure investment.
- *A school system* might be viewed by teachers as a learning environment, by parents as a support structure, and by budget officials as a cost centre.
- *In healthcare*, a hospital administrator might focus on operations, while a patient cares more about trust, access, and well-being – each framing defines different boundaries.

Perspectives

Perspectives describe the different ways people understand and define a system. What one person sees as a problem, another might see as a solution, or does not see as a problem at all. These differences depend on people's roles, values, experiences, and positions within or around the system [8].

In systems thinking, perspectives are not just opinions, they also shape how systems are mapped, which elements are considered important, and what outcomes are pursued. Overlooking them risks creating narrow, incomplete, or biased understandings of the system.

These views are not fixed, people may revise their understanding through dialogue, learning, or exposure to new evidence.

Recognizing these different views doesn't make things easier, but it does make our understanding of systems more honest, inclusive, and useful.

The following examples highlight how different viewpoints can shape how a system is described or understood.

Examples

- A patient sees the healthcare system as a lifeline. A nurse sees it as a place of work. A government administrator might see it mainly in terms of cost and efficiency.
- A river might be viewed as a sacred site by Indigenous communities, a resource by farmers, or a hazard by flood managers.
- A school system can be seen as a place for learning by students, a job environment by teachers, and a policy tool by education departments.

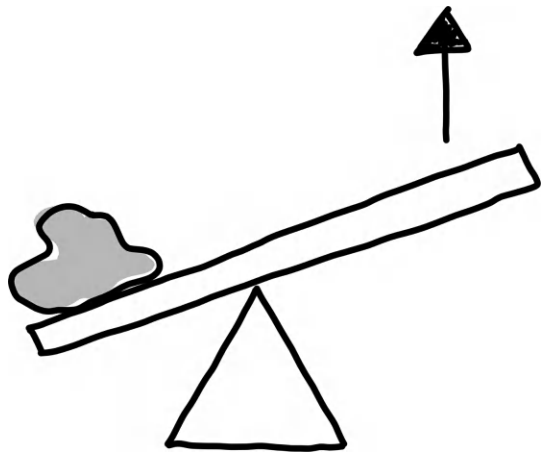
Leverage Points

Leverage points are places in a system where a small shift can lead to big, lasting change [73]. These points matter because they show us where to act if we want the most impact with the least effort, like a well-placed push on a seesaw on a children's playground.

Donella Meadows, a key voice in systems thinking, described different kinds of leverage points – some easier to change, others more powerful. For example, changing numbers (like tax rates) is a shallow leverage point. Changing how people think or what goals the system serves is much deeper – and often harder – but it can transform the whole system.

While the term "points" is widely used, it can be misleading. These aren't fixed spots in a machine. Often, they are patterns of interaction, relationships, or flows within the system – ongoing structures that shape behaviour over time.

Understanding these deeper patterns helps us move beyond surface fixes and focus on changes that truly last. It also helps avoid wasting time on adjustments that won't matter in the long run.



The following examples show how targeted changes in the right place can shift the behaviour of an entire system.

Examples

- Improving how *information flows in an organization* (e.g., clearer internal communication) can boost trust, reduce delays, and raise morale.
- *In a transport system*, changing road rules might help, but changing how people *think* about car use (e.g., encouraging bikes or public transit) can shift the entire system.
- *In education*, changing test formats might tweak outcomes. But shifting the purpose of schooling – from performance to learning – can reshape the system completely.

The principles earlier reflect core concepts commonly discussed in systems thinking literature. Different authors and schools of thought may emphasize additional principles or frame them differently, depending on their perspective, discipline, or purpose. Still, these concepts offer widely used tools to see patterns, uncover causes, and better understand how systems behave not just in theory but also in real-world systems. Together, these concepts shift our attention away from quick fixes and isolated symptoms toward deeper structures, relationships, and dynamics.

Systems thinking is especially valuable when working with uncertainty, change, and interdependence – as found in public health, education, urban planning, environmental policy, and organizational life. It equips us to see more clearly, act more thoughtfully, and stay aware of how our own framing shapes what we notice and how we intervene.

In the end, systems thinking doesn't promise control or simple answers. Instead, it offers better questions, deeper insight, and more realistic ways to engage with the world we live in.

Think in Systems

Thinking in systems starts with attention – what you notice, what you ignore, what you assume, and how you decide what something is "really" about.

In systems work, the way we frame things often *is* the work. A person who sees only parts will act on the parts. Someone who sees relationships and feedback will act very differently. This chapter is about that difference.

We're not looking for the "right" mindset as a fixed thing. It is a way of noticing – a set of thinking habits, such as the following:

- Paying attention to what's included and what's excluded
- Asking what parts make up a system – and how those parts relate
- Watching for patterns, not just events
- Remembering that every view is just that – a view, from somewhere

These are subtle shifts in how people make meaning. Some of these habits have been formalized into structured models. For example, Cabrera and Cabrera [53] describe four basic habits: making distinctions, recognizing part-whole systems, identifying relationships, and taking perspectives. They call it the DSRP Framework, which is also presented later in this book (cf. Part 3). This framework is a structured method for thinking that helps build the habit of pausing, slowing your immediate reaction, and looking one level deeper.

When someone says, "This process is broken," pause:
What's the process? Where does it begin? What's assumed to be inside it? Who's left out?
When someone says, "We need to fix this," ask:
Is it a one-time event or part of a longer pattern? What's reinforcing it? Who benefits from how it works now?

Systems thinkers do not have magic answers. They simply ask better questions – earlier. The rest of this chapter explores these habits: how they work, why they matter, and how they shape what happens next.

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7 Core Habits for Systems Thinkers

Systems thinking is not limited to diagrams or terminology. It represents a shift in how we perceive and interpret the world around us. The habits discussed here are not sequential steps but cognitive practices – ways of directing attention to aspects that often remain hidden: feedback loops, time delays, interconnections, mental models, and one's own role in shaping the systems being observed.

They are shared mental practices drawn from over six decades of systems research and application across disciplines. They synthesize recurring insights found in core systems traditions, including the following:

- System dynamics, pioneered by Jay Forrester [59] and developed by John Sterman [71];
- Organizational learning, through Peter Senge's five disciplines [52];
- Cybernetics, introduced by Norbert Wiener [57] and extended by von Foerster [36];
- Soft systems methodology, from Peter Checkland [32]
- Critical systems thinking, advanced by Churchman [69], Ulrich [22], and Midgley [8]; and
- And leverage-focused interventions, through Donella Meadows [33, 73].

Different thinkers emphasize different habits – some include more, others fewer. The seven included here reflect patterns that appear across major sources. They serve as practical anchors for engaging with complex systems – supporting awareness of feedback, delays, interconnections, boundary choices, mental models, and one's role as both observer and actor.

Together, these habits form a usable foundation for systems thinking in action – not to replace existing methods but to sharpen the mindset behind them.

We now turn to the individual habits, starting with the following:

1. Look for Patterns, Not Just Events

When something happens – a missed deadline, a sudden breakdown, an unexpected success – our natural tendency is to focus on that isolated incident. Systems thinkers, however, train themselves to see beneath these surface events to the patterns generating them.

As Jay Forrester [59] demonstrated in his foundational work on system dynamics, what appears as a crisis or sudden change is often just one visible point on a longer trajectory. The isolated event isn't the story; the underlying structure producing it is what matters. These structures often involve reinforcing feedback loops, delayed effects, or accumulated pressure that eventually crosses a threshold.

In practice, this means asking:

- "Is this part of a recurring pattern we've seen before?"
- "What trends are forming over time that might explain this event?"
- "If we graphed this situation over months or years, what curve would we see?"

John Sterman [71] emphasized that graphing behaviour over time is essential for exposing system dynamics that remain invisible when we fixate on individual incidents. And as Peter Senge observed, "Seeing patterns of behaviour rather than events is the beginning of systems thinking" [52].

This shift – from reacting to individual events to recognizing underlying patterns – moves us from reactive firefighting to genuine systems insight. It's the foundation for all other systems thinking habits.

2. Always Ask: What's the System?

Before attempting to solve a problem, systems thinkers first clarify: What system are we actually dealing with? Where does it begin and end? Who and what should be included in our analysis?

These boundary questions aren't merely technical decisions; they're profoundly consequential choices that determine what gets attention and what remains invisible. C. West Churchman [69] was among the first to highlight the ethical dimension of system boundary judgments, noting that how we define a system inherently privileges some perspectives while marginalizing others.

Werner Ulrich formalized this insight through his Critical Systems Heuristics [22], providing structured methods for questioning boundary assumptions. As he noted, "Every boundary judgment has ethical consequences." Deciding what's "in" vs. "out" of our system analysis directly shapes what solutions become possible.

When engaging with any system, ask:

- "What elements and relationships am I including in this system?"
- "What important factors might I be overlooking or excluding?"
- "Who benefits from defining the system boundaries this way?"
- "Whose perspectives or needs are being marginalized by this framing?"

Building on Ulrich's work, Gerald Midgley [8] incorporated boundary critique as a reflexive practice – a way to systematically question how we're defining problems and who gets to participate in finding solutions. This critical awareness of boundary judgments helps prevent the common mistake of solving the wrong problem precisely.

3. Zoom In, Zoom Out

Systems reveal different patterns depending on our level of focus. What appears as individual miscommunication at a close-up level might reveal itself as systemic understaffing or structural pressure when viewed from a broader perspective.

Systems thinkers cultivate the ability to shift their vantage point deliberately – moving between detailed examination and bird's-eye view to gain richer understanding. This capacity to change scale perspective connects to Holling's panarchy theory [74], which demonstrates how systems operate simultaneously at different spatial and temporal scales, with different dynamics emerging at each level.

This habit involves conscious perspective shifts:

- Zoom in: What specific interactions and behaviours are occurring in detail?
- Zoom out: What broader patterns become visible from a distance?
- Change time scales: How does this look over days vs. decades?

Peter Senge [52] emphasized this movement between the parts and the whole as essential for understanding underlying system behaviour. Similarly, Frank Geels [75] showed how innovation and transition processes can only be understood by examining interactions across micro (individual), meso (organizational), and macro (societal) layers.

When a situation seems confusing or intractable, try changing your zoom level; the problem might look entirely different from another scale.

4. Follow the Relationships

Traditional analysis breaks systems into their component parts. Systems thinking reverses this approach, recognizing that a system's behaviour emerges primarily from the relationships between elements, not from the elements themselves.

This perspective traces back to Norbert Wiener's [57] pioneering work in cybernetics, which placed feedback and communication at the centre of understanding complex systems. W. Ross Ashby [34] extended this by exploring how relationships create self-regulation and stability in natural systems. Gregory Bateson [76] further advanced this thinking, arguing that the basic unit of survival is not the individual but the relationship. His work laid the foundation for relational thinking in systems science.

For social systems, Niklas Luhmann [54] argued that communication itself forms the system. Social systems emerge through ongoing exchanges of information and meaning, rather than from individual people or fixed structures.

And Donella Meadows [33] noted, "The structure of a system is the pattern of interconnections between its components." Changing a single

relationship – creating a new information channel, modifying a feedback loop, introducing a different decision rule – can transform system behaviour without changing any of the components themselves.

When analysing a system, focus your attention on:

- What's influencing what? Where do causal connections flow?
- Where is information flowing well or getting blocked?
- Are there reinforcing loops (where change accelerates) or balancing loops (where change is resisted)?
- What relationships seem missing that might make the system work better?

Fritjof Capra and Pier Luigi Luisi [77] reinforced this relational perspective from biological and cognitive science, showing how living systems exist fundamentally as relationship networks.

When you're trying to understand or change a system, don't look harder at isolated parts; look between them, at the connections.

5. Respect Delays

One of the most common mistakes in dealing with systems is expecting immediate results from our interventions. In reality, most systems have built-in delays – gaps in time between actions and their full effects, between decisions and their consequences, between problems and their visible symptoms.

Jay Forrester [59] demonstrated mathematically how even small delays in feedback loops can destabilize entire systems, leading to oscillations or unexpected outcomes. John Sterman's [71] experimental work showed that people consistently underestimate or misread delays, contributing to poor decision-making, especially in policy and organizational settings.

These time delays are particularly prominent in social, ecological, and economic systems:

- A company implements a new strategy, but results may take quarters or years to materialize
- A community adopts sustainability practices, yet environmental improvements lag behind
- A government changes policy, while effects ripple through society gradually

When working with systems, build delay-awareness by asking:

- "Where are there significant time gaps between cause and effect?"
- "How long might it reasonably take to see results from this intervention?"
- "What might happen if we act repeatedly before seeing the full effects of earlier actions?"

Meadows [33] noted, delays are one of the core system structures – and one of the most frequent sources of surprise – because they disconnect cause from effect over time.

Respecting these delays is essential for patience, appropriate timing, and avoiding the dangerous overcorrection that happens when we can't wait for feedback.

6. Notice Mental Models

Systems don't exist only in the physical world; they're also shaped by the cognitive frameworks we use to understand them. Mental models are the deep, often unconscious assumptions, beliefs, and frames through which we interpret reality. They determine what problems we recognize, what solutions we consider viable, and what metrics we value.

Peter Senge [52] identified mental models as one of five disciplines essential for building learning organizations, arguing that unexamined assumptions frequently block systemic insight. Similarly, Donella Meadows [73] placed paradigms – shared belief systems – near the top of her hierarchy of leverage points, showing how changing underlying mindsets can transform entire systems more powerfully than adjusting parameters or rules.

As Chris Argyris and Donald Schön [78] discovered, people often operate from implicit "theories-in-use" that contradict their stated intentions, creating systems that undermine the very goals they claim to pursue.

To surface these hidden models, systems thinkers regularly ask:

- "What core assumptions are we making that might not be true?"
- "Whose worldview is shaping how this problem is defined?"
- "What alternative perspectives might lead to different solutions?"
- "What are we collectively taking for granted that could be questioned?"

Derek and Laura Cabrera [53] advanced this work by developing DSRP theory (Distinctions, Systems, Relationships, Perspectives) to make mental models more explicit and workable. Their approach demonstrates that becoming aware of our conceptual frameworks is not merely philosophical; it's practical and essential for effective systems change.

7. Stay Aware of Your Role

As a systems thinker, you are never a neutral observer standing outside the systems you study or seek to change. You are inherently part of those systems; your questions, your presence, your framing, and your interventions actively shape what emerges.

This insight stands at the heart of second-order cybernetics, developed by Heinz von Foerster [36], who insisted that "the observer must be included in the description of the system." Humberto Maturana and Francisco Varela [67] provided biological foundations for this view, demonstrating how cognition itself is fundamentally participatory and bound within systems.

Peter Checkland [32] embedded this principle in Soft Systems Methodology, where the practitioner explicitly acknowledges their role within the inquiry process. Similarly, Werner Ulrich [22] showed how the observer's values, interests, and position must be made transparent to ensure ethical systems practice.

This reflexive awareness raises important questions:

- "How might my presence be influencing what I'm observing in this system?"
- "What biases and blind spots am I bringing to this situation?"
- "How do my own goals and needs shape what I see as 'the problem'?"
- "What role am I playing in how this system is evolving?"

This isn't mere philosophical reflection; it's practical humility. Recognizing your participation in the systems you wish to understand or change helps avoid the trap of presumed objectivity, opening space for more authentic engagement with complexity.

These seven habits aren't acquired overnight. They represent an ongoing practice of perception, reflection, and engagement. They help us to spot patterns where others see random events, notice connections where others see separate parts, and include ourselves in the system we're working with.

By cultivating these habits, we develop what systems pioneer Donella Meadows called "systems wisdom" – not just technical skill with models and methods but a deeper capacity to work with rather than against the nature of systems [33].

How Systems Thinkers Make Meaning

Systems thinkers don't start with a fixed plan. They start with a different way of making sense of what's in front of them. The habits from the last section aren't just theory; they shape how people interpret real-world situations.

Where others might see confusion, contradiction, or chaos, systems thinkers ask different kinds of questions. Not because they know more – but because they're trained to look for structure, patterns, and relationships.

We might say, "It's not about having the full picture. It's about seeing enough to act wisely."

This reflects the core principle of bounded rationality [38] combined with systems pragmatism: you never see the whole system, but you act wisely by watching

structure and patterns. Also aligns with Schön's idea of "reflection-in-action" [79] and Checkland's Soft Systems Methodology [32].

Next, we look at how systems thinkers make meaning in practice:

They look for structure before they look for solutions

If a problem keeps coming back, systems thinkers don't reach for a quick fix. They pause and ask:

What's reinforcing this? What's built into the structure that makes this outcome likely?

Structure could mean:

- Rules (formal or informal)
- Information flows
- Incentives
- Habits
- Feedback loops
- Delays

They ask: *What's creating this behaviour – not just today but consistently?*

This is straight from the system dynamics tradition – especially Forrester [59] and Sterman [71]. Meadows also emphasized structure as the source of system behaviour: rules, feedback loops, delays, etc. [33].

They Delay Reaction to Observe the System

Instead of rushing to solve a problem, systems thinkers often hold back – just long enough to see what the system is actually doing. They resist the urge to respond immediately because they know that systems don't always respond in linear ways.

This doesn't mean doing nothing. It means noticing more before acting – especially:

- Time delays
- Patterns that repeat
- Unintended consequences

Similar patterns appear in Sterman's work on "worse-before-better" behaviour and decision delays [71] and in Meadows' warning that acting too early can backfire [33].

They Reflect on How They're Framing the Situation

No one is neutral. Systems thinkers are aware that *they're part of the system too.* Their role, perspective, and assumptions all influence what they see – and what they don't.

They ask themselves:

- "What story am I telling about this system?"
- "What's assumed in how I've defined the problem?"
- "Who's not in the room, and how might they see this differently?"

This reflection is not abstract theory. It helps reduce blind spots and keeps actions grounded in the real situation, not personal bias.

The idea draws on Critical Systems Thinking [8, 22, 69], mental models and reflection [52], and Soft Systems Methodology [32], which sees system framing as shaped by the perspectives of those involved.

They Look for Places with Leverage

Systems thinkers know that not all actions have the same effect. Some changes matter more – not because they're louder or more expensive but because of where they happen in the system. A small shift in the right place can lead to a big change.

They look for those places – where a pattern can shift, not just a symptom patched. These are called *leverage points.*

Donella Meadows [73] named 12 such points, from the shallowest (like adjusting numbers or buffers) to the deepest (like changing the system's purpose or mindset).

Systems thinkers ask:

- "What's holding this pattern in place?"
- "Where's the point that shifts the system itself – not just the surface?"
- "Am I pushing hard – or pushing smart?"

Meadows' work on leverage points [73] is being discussed in other places of this book (cf. Part 1 – Chapters 2 and 4).

The core idea if it: don't just do more; look for what matters most.

They Choose Action Based on System Behaviour

There's no one-size-fits-all method. Systems thinkers choose actions based on how the system behaves – not based on habit, pressure, or urgency alone.

- Sometimes that means disrupting a loop.
- Sometimes it means slowing down.
- Sometimes it means creating space for learning or reflection.

It's not about control; it's about alignment.

This connects to adaptive management, complexity-informed design, and feedback-aware interventions. The same idea runs through Meadows on acting based on system structure [33], Snowden's Cynefin Framework on choosing actions that fit the domain [49], and Schön's work on reflective action in evolving situations [79].

It's not about having more data. It's about paying attention differently. That shift is what makes systems thinking useful – not just as a concept but in practice.

We've looked at how systems thinkers pause, notice patterns, reflect on framing, search for structure, and choose actions that fit system behaviour. Now it's your turn to see how these habits show up in your own thinking.

Are you ready for a small experiment?

Self-Check: Are You a Systems Thinker?

Here's a simple checklist to self-check your current habits.

It's not a test, just a way to notice how you tend to think, observe, and respond. No pressure to tick every box. Just notice what feels familiar – and what might be new. Just use it to reflect. The point is to start noticing your own thinking in real time.

When I look at a situation . . .

- ☐ I pause before jumping to solutions.
- ☐ I look for patterns, not just isolated events.
- ☐ I ask what's reinforcing or balancing the current behaviour.
- ☐ I pay attention to what's included and what's left out.
- ☐ I try to see how parts relate and influence each other.
- ☐ I consider who is affected, even if they're not visible.
- ☐ I shift between detail (zoom in) and big picture (zoom out).
- ☐ I notice my own assumptions and framing.
- ☐ I ask how my actions might shape the system.
- ☐ I act with awareness, even when things feel uncertain.

Pick one or two that you don't usually do; you are invited to try them out this week. Nothing big. Just something small – a conversation, a meeting, a stuck moment.

In the next chapter, we shift from seeing to navigating. You'll explore tools to help act in systems that are fast-changing, uncertain, or stuck.

Navigate in Systems

Understanding systems is one thing. Navigating them is another.

Real-world systems are often messy. They shift as you act. Effects don't always show up where or when expected. Goals compete, feedback loops surprise, and progress can be slow or uneven.

Many of the ideas introduced earlier – delays, nonlinearity, multiple perspectives, emergence – aren't just academic concepts. They are the reason why working in real-world systems is often difficult.

Real-world systems can't be controlled like machines. They have to be worked with – relationally and adaptively [80].

This part of the book builds on the previous chapters. It focuses on how to *navigate real-world systems,* especially when they tend to get more complex. That means combining reflection and action, using both systemic awareness and systematic methods to make sense, choose strategies, and intervene wisely.

To do this, it helps to look at two different ways of thinking: *systemic* and *systematic*. Each one plays a different role when working in challenging situations.

Systemic and Systematic Thinking in Systems

When working with real-world systems, it's helpful to distinguish between two ways of thinking that are often confused: *systemic* and *systematic*. While the terms sound similar, they describe different mental orientations, and each plays a distinct role in practice.

- *Systemic thinking* looks at relationships rather than isolated parts. It seeks to understand how parts interact, how feedback and delays shape behaviour, and how change in one place can affect outcomes elsewhere. This perspective is relational and contextual. It emphasizes patterns, connections, and unintended consequences. Grounded in the traditions of systems science and systems thinking (e.g. [8, 32, 33, 52]), systemic thinking asks: *What is influencing what? What is shaping the system's behaviour? What's missing from the frame?*

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- *Systematic thinking* is methodical. It is about following clear steps to solve a problem or implement a plan. Often used in engineering, policy design, or project management, systematic approaches rely on checklists, procedures, and repeatable sequences. They are valuable for clarity, efficiency, and accountability – especially when problems are well-defined and environments are relatively stable.

Rather than choosing one over the other, we often need both. *Systemic thinking* helps us understand the situation; *systematic thinking* helps us respond to it. The challenge is switching between the two – zooming out to see the full picture, then zooming in to act in a focused way.

But before we act, we still need to be clear on what we're acting on. That's where framing comes in – shaping how we see the situation, what we focus on, and how we define success.

Framing and Sensemaking in Systems

Before jumping into action, it's worth to pause and ask:

How Are We Framing the Situation?

While diagnosis helps us understand the kind of system we're dealing with, framing shapes how we move forward – what we focus on, who we involve, and how we define success.

A number of approaches have been developed across design, systems thinking, and organizational change that support this early sensemaking phase. They come from different traditions, but many have become particularly influential in practice, not because they offer step-by-step answers but because they help teams work with ambiguity, surface assumptions, and move forward with care. This section briefly introduces several of these approaches. Many are explored in more detail later in the book, with guidance on how they can be used in practice (cf. Part 3).

Some frameworks focus on identifying the type of context:

- The Cynefin Framework distinguishes between clear, complicated, complex, and chaotic environments – each requiring a different kind of response [49].
- The Certainty-Agreement Matrix maps the level of agreement and certainty in a situation, showing when linear plans break down and adaptive strategies are needed.
- Poli's distinction between complicated and complex systems adds a helpful layer: some situations can be solved through analysis; others must be navigated relationally [80].

These frameworks don't describe the system itself. They offer a theoretical approach for how to think about a situation. A system may show features from different categories at the same time. The frameworks support choosing which approaches might fit best to start with, depending on uncertainty, dynamics, and the questions being asked.

Other approaches focus more on how to explore and reframe problems:

- Soft Systems Methodology [32]: Helps structure conversations across different stakeholder views, without forcing a single problem definition.
- DSRP [53]: Offers a way to reflect on how meaning is constructed – by noticing distinctions, systems, relationships, and perspectives.
- Critical Systems Heuristics [22]: Surfaces boundary judgments – who is included, whose views count, and what values shape the problem definition.
- Rich Pictures [64]: A visual tool to map out different perspectives, relationships, and concerns early in the process.

Still others come from participatory and exploratory practice:

- Design Thinking [81]: Supports user-centred exploration through iterative prototyping and testing.
- Double Diamond [82]: Structures problem-solving into phases of divergence and convergence – exploring the problem before defining solutions.
- Design Journey [83]: Guides teams through reflective, participatory exploration to frame complex challenges.
- Theory U [84]: Helps teams sense emerging futures through dialogue, deep reflection, and co-creation.
- Appreciative Inquiry [85]: Uses strength-based inquiry to surface shared values, hopes, and possibilities for change.

Despite their differences – or shared roots – what unites these methods is a common rhythm. They help people pause, sense, and reflect before acting.

Most follow a similar structure:

- *Open up* – explore the landscape, listen widely, and suspend assumptions
- *Make sense* – identify patterns, reframe the challenge, and clarify the system
- *Align and act* – converge on insights, test directions, and reflect together

Used well, these approaches support more thoughtful and inclusive action. They don't simplify the complex nature of real-world systems, but they help us work with it more wisely.

In the next section, we connect this framing work to strategic thinking and leverage points – the tools that turn insight into action.

Preparing to Act in Systems

Once you've seen the system and framed the situation, the next question is this:

Where Do You Start?

We've learned, in systems, you rarely know the full answer up front. That's not a problem. Systems thinking isn't about finding certainty; it's about acting wisely while staying open to what the system reveals.

This means:

- Acting with the system, not against it
- Expecting unintended consequences
- Testing small changes before scaling
- Involving people who are affected
- Being ready to adapt as you learn

You don't need a master plan. You need a clear direction, a good place to begin, and the flexibility to adjust as the system responds.

Where action is most effectively is focus of our next section.

Diagnosing the Problem

Before action can be taken in systems, it is essential to pause and ask:

What Kind of Problem Are We Working on?

Karl Popper [86] used a metaphor to explain different types of systems and predictability. He described two types: *clocks* and *clouds*.

- A *clock problem* is structured and predictable; you can break it into parts and solve it.
- A *cloud problem* is messy and unpredictable; it shifts while you're trying to define it.

Why this matters: Different problems need different tools. If you treat a cloud like a clock, you'll over-analyse and get stuck. If you treat a clock like a cloud, you'll waste time exploring what's already clear.

Use the following criteria to help choose the right method for your situation:

- *Problem Type:* Is it from your perspective: simple, complicated, or complex? Is it structured and clear, or messy and uncertain?
- *Purpose:* What do you need to achieve – understanding, action, planning, learning?

- *People:* Who needs to be involved? How much input or participation is needed?
- *Resources:* How much time, skill, and capacity do you have?
- *Evidence:* Do you need stories and insights, numbers and data, or both?

Unfortunately, there is no perfect formula for addressing cloud problems. Different situations call for different approaches. Instead of searching for a single correct answer, systems thinkers stay open, observe carefully, try approaches that fit, and adjust as the situation develops.

Trying to apply a fixed recipe would narrow your thinking rather than broaden it. Use the problem characteristics as a guide: notice the type of problem, apply a fitting approach, see what it reveals – and adjust. That's systems thinking in practice.

Now, once the nature of the problem is clearer, the next question is where change might have the greatest effect within the system. This leads to the idea of leverage points – places where small shifts can produce larger system-wide impact.

Finding Leverage and Acting in Systems

Not all actions in a system are equal. Some changes adjust the surface. Others reshape how the system behaves. A few can shift the system's purpose entirely. So it's important to clarify:

Where to Intervene to Create Meaningful Change?

Donella Meadows [73] described 12 *leverage points* – places where a small change can produce big results. They range from basic tweaks to deep shifts in purpose and mindset. Knowing where you're intervening helps clarify what kind of change you're aiming for – and what kind of tools you'll need.

For clarity and ease of use, I organized the 12 leverage points into three levels – tweaks, structures, and mindsets – ranging from surface adjustments to deep transformation.

The hospital example introduced earlier (Part 1 – Understand Systems) is used throughout this section to illustrate each leverage point with practical examples and explanations.

Tweaks

These are the most visible and often easiest types of changes – adjusting parameters, increasing capacity, or speeding up response times. They affect how the system operates on the surface but usually don't shift underlying patterns. Their impact tends to be short-term unless supported by deeper change.

#	*Leverage Point*	*Example*
12	Parameters	Adjusting nurse-to-patient ratio
11	Buffers	Adding more intensive care beds
10	Stocks and flows	Redesigning hospital layout to improve flow
9	Delays	Reducing time for lab analysis

Explanations

- Point 12: Adjusting nurse-to-patient ratios can improve care quality and reduce stress, but effects depend on staffing models, funding, and overall system goals.
- Point 11: Expanding critical care capacity provides resilience during surges, though long-term effectiveness depends on patient flow and demand patterns.
- Point 10: Rethinking the physical layout to support smoother patient flow can reduce delays and improve coordination across units.
- Point 9: Speeding up lab turnaround enables faster decisions, especially when supported by aligned processes and staffing.

Structures and Rules

These points shape the internal logic of the system – what it responds to, how it adapts, what flows where, and who makes decisions. Intervening here means working with the feedback loops, rules, and flows of information that govern system behaviour. Changes at this level are harder to make but often more durable and far-reaching.

#	*Leverage Point*	*Example*
8	Balancing feedback loops	Use infection control to prevent outbreaks
7	Reinforcing feedback loops	Patient reviews attracting more patients
6	Information flows	Sharing real-time bed availability with staff
5	Rules	Changing how patients are admitted

Explanations

- Point 8: Disinfection routines act as balancing feedback – limiting the spread of infection and helping the system maintain safe, stable conditions.
- Point 7: When positive patient experiences are shared publicly, they can draw in more patients, reinforcing system growth and influencing demand patterns.
- Point 6: Giving staff access to live data on bed availability supports faster, better decisions, especially when that information is accurate, timely, and actionable.
- Point 5: Revising how patients are accepted for care (e.g., triage criteria) shifts who receives attention and when, affecting the system's internal priorities and flow.

Mindsets and Purpose

These are the deepest leverage points – the beliefs, values, and goals that define what the system is for. Changes at this level affect how the system sees itself and

what it aims to do. While these shifts are the hardest to reach and often slow to unfold, they can lead to the most powerful and lasting transformations.

#	*Leverage Point*	*Example*
4	Self-organization	Staff teams designing their own workflows
3	System goals	Focusing on patient well-being, not throughput
2	Mindsets or paradigms	Seeing patients as partners, not cases
1	Transcending paradigms	Combining medical care with community healing

Explanations

- Point 4: When staff teams co-design their workflows, the system becomes more adaptive and grounded in real-world needs, allowing for more responsive and resilient operations.
- Point 3: Shifting the hospital's goal from processing volume to improving patient well-being reorients decisions, success metrics, and care strategies across the system.
- Point 2: Viewing patients as partners in care challenges traditional hierarchies and enables more collaborative, trust-based approaches that influence outcomes and relationships.
- Point 1: Transcending a single medical model makes space for integrating broader definitions of health, such as including social, cultural, or spiritual dimensions alongside clinical care.

Often, change efforts stay near the surface – adjusting parameters, incentives, or capacity. These changes can help in the short term but usually don't shift the system's underlying patterns. More durable change often requires working at deeper levels: revising rules, changing goals, or challenging mindsets.

Similar ideas to Meadows' approach appear in Goldratt's Theory of Constraints [100] which targets the key bottleneck, Beer's Viable System Model [61] which identifies weak subsystems, Checkland's Soft Systems Methodology [32] which builds accommodation between different worldviews, and Churchman's critical systems thinking [69] which brings forward voices that are usually marginalized. But knowing where to intervene is only part of the work. The next challenge is how, which methods to use, who to involve, and what kind of change is possible.

Some Caution Is Needed

Meadows' list is an incredibly helpful set of points for identifying *where to intervene.* At the same time, it doesn't fully address the next challenge:

How to Intervene?

As real-world systems are often messy, adaptive, and unpredictable, a leverage point at one scale may not exist, or may backfire. In some cases, changing mindsets or goals directly may not be possible.

That's why it's often helpful to start with small experiments – testing changes, watching how the system responds, and adjusting based on what emerges. Involving diverse perspectives also helps since no one person sees the full picture.

To support this, the methods in this book are grouped into five categories – the *5M Structure.* It's not a fixed process but as a simple structure to help you choose what might be useful depending on your situation.

The 5Ms are: Motivate, Meet, Map, Make, Manage.
Each group includes approaches you can explore and apply, while staying aware of the system as a whole.

In the next chapter, we explore how to choose methods and approaches that fit your situation and support effective action.

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Part 2

Select Methods for Systems Practice

This part presents how the methods in this book are structured to support systems practice to explore situations, engage people, develop interventions, and learn from the outcomes. The methods support different stages of systems work, depending on the situation, the people involved, and the questions at hand.

First, we'll look at why these methods were selected, where they come from, and how they are organized. Then you'll find guidance for selecting which methods to apply depending on your situation.

Why This Set of Methods

Asking why a set of methods was chosen or not can start useful conversations about completeness and incompleteness. From a systems perspective, any view of a situation depends on the lens used to look at it. For some systems thinkers, approaches not included in this book may still appear relevant or feel more appropriate than others. Recognizing that no collection can ever be complete is part of the practice itself, keeping the work open to ongoing revision and growth. Its purpose is to offer a practical set of approaches for systems thinking and decision-making. Some focus on understanding relationships and power dynamics. Others help visualize complex challenges, develop creative solutions, or anticipate long-term consequences.

Each method can be used alone or combined, depending on the specific challenges with and in the system. The goal is to give practitioners approaches they can apply both strategically and operationally.

Together, these methods provide a structured, interactive, and action-oriented way to work in systems – supporting readers make better decisions, foster new solutions, and create change that lasts.

Where These Methods Come From

The methods in this book aren't drawn from a single school of thought or framework. They come from a mix of sources: some grounded in academic research

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or widely used professional practice – like Causal Loop Diagrams, Appreciative Inquiry, or the Balanced Scorecard – and others drawn from facilitation work, systems practice, and creative group processes.

Some communities, like the Systems and Complexity in Organisation (SCiO) [87], highlight methods commonly used in systemic practice through their competency framework. Similarly, Jackson's System of Systems Methodologies (SSM) [22] groups a set of well-established systems approaches based on his view of different problem situations. Both provide guidance for method selection, but neither sets a strict boundary around what counts as a systemic method.

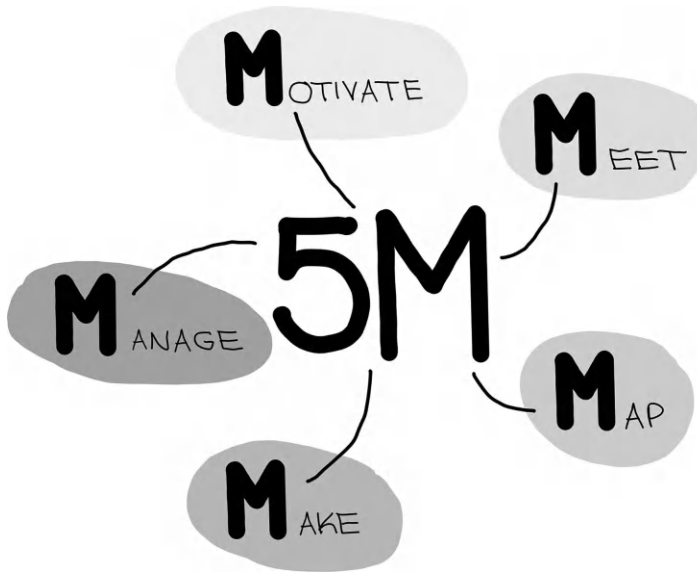
The methods in this book reflect a broad, practice-based view: Not all included methods are recognized in formal frameworks, but all may be used by systems thinkers to explore complexity, reflect, and act in real-world settings. This includes tools from facilitation, simulation, group dynamics, and related fields. Some are analytical or experiential. Others support learning, planning, or collaborative sensemaking.

None of these methods are presented as rigid solutions. They are not all "evidence-based" in a strict academic sense, but they are evidence-informed, which means tested by teams, communities, and organizations navigating challenging situations.

Use what fits. Adapt what helps. These aren't rigid formulas, they're approaches to spark thinking, sensing, making, and adjusting in systems that keep changing.

The 5M Structure

In this book, the methods are organized into five categories, the *5M Structure*, where the *Ms* stand for: *Motivate, Meet, Map, Make,* and *Manage.*



This structure offers a simple, practical way to organize, select, and apply methods depending on the situation. Each category supports a different type of work – from deciding whether to intervene, to engaging people, understanding systems, taking action, and adapting over time. It's a flexible way to organize methods and choose useful approaches depending on the situation. Each category includes a range of methods – from simple to advanced – covering different levels of cognitive effort and creativity. In real work, you may enter at any point or move back and forth between categories and approaches.

In organizations and other complex systems, isolated fixes rarely work. We need to recognize patterns, understand relationships, design smart responses, and track effects over time. That's why the methods are categorized this way – not just to analyse systems but also to engage with them and create change.

Let's take a quick walk through the *5Ms* and how they support your work:

- **Motivate: Why and What For?**
  Clarifies why intervention is needed and what purpose it serves. Helps teams assess motivation, urgency, and alignment with larger goals.
  Example methods: Deciding to Act, Guiding Star and Near Star.
- **Meet: Engage Stakeholders and Perspectives**
  Focuses on identifying key stakeholders, facilitating discussions, and surfacing different perspectives. Brings people together to build dialogue, collaboration, and shared understanding.
  Example methods: Stakeholder Mapping, World Café, Cluster Mapping.
- **Map: Understand the System**
  Supports teams in visualizing structures, dependencies, recurring patterns, and leverage points. Supports a deeper understanding of system dynamics and where interventions may have the greatest effect.
  Example methods: Causal Loop Diagrams, Rich Pictures.
- **Make: Take Action and Create Solutions**
  Supports improving processes, testing ideas, and developing solutions. Encourages teams to challenge existing structures, experiment with new approaches, and refine solutions iteratively.
  Example methods: Paper Airplane Factory, Process Hacking, Prototyping Sprints.
- **Manage: Evaluate and Adapt Over Time**
  Enables teams to track changes, measure progress, and respond to emerging patterns. Supports organizations monitor outcomes, evaluate effectiveness, and adjust as conditions evolve.
  Example methods: Balanced Scorecard, Scenario Stress Testing.

Focus Areas of Methods

Each method also links to focus areas, which describe what the method is most effective at achieving. While *5M* organizes methods by type of work, focus areas are intended to support matching methods to goals.

The five focus areas are as follows:

- *Understand:* Visualize, map, and make sense of systems – their parts, connections, and structure – to find causes and relationships.
- *Collaborate:* Involve people, gather different views, create shared understanding, and align stakeholders toward common goals.
- *Strategize:* Plan solutions that address system complexity while considering long-term outcomes.
- *Innovate:* Support creative thinking and find unique solutions when usual approaches aren't enough.
- *Adapt:* Monitor, evaluate, and refine processes as conditions change and new information appears.

In *The 5M Methods Matrix*, focus areas are indicated by check marks.

With these focus areas defined, you can now select methods that fit your situation.

The 5M Methods Matrix

The 5M Methods Matrix supports readers in matching appropriate methods to challenges. It provides a practical way to select methods based on where you are in your systems work, what you want to achieve, and who is involved.

The *5M Methods Matrix* is organized in the following categories: *Motivate, Map, Meet*, *Make*, and *Manage*.

You can use the following steps to select methods that fit your situation:

1. *Identify relevant "M":* Consider which of the five areas are most relevant to your current challenge.
2. *Review the purpose:* Look at the specific purpose of each method to see which matches your goals.
3. *Consider the focus area:* Check which aspects (Understand, Collaborate, Strategize, Innovate, Adapt) each method supports.
4. *Select appropriate method:* Choose one or more methods that fit your situation and priorities.

With these steps in mind, we now turn to the matrix itself.

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Motivate: Why and What For?

This section focuses on methods that help practitioners assess the need for systemic intervention and define strategic directions for meaningful change.

Method	*Purpose*	*Understand*	*Collaborate*	*Strategize*	*Innovate*	*Adapt*
Deciding to Act	Assess the necessity and urgency of intervention	✓		✓		✓
Readiness Assessment	Evaluate system readiness for intervention	✓	✓	✓		✓
Guiding Star and Near Star	Define vision and milestones for intervention	✓	✓	✓		✓
Cynefin Framework	Categorize and understand system complexity	✓		✓		✓
Certainty-Agreement Matrix	Align decisions with levels of certainty and agreement	✓	✓	✓		✓
Power Mapping	Analyse power dynamics and influence in systems	✓	✓	✓		✓

Meet: Engage Stakeholders and Perspectives

This section emphasizes stakeholder involvement, collaboration, and capturing different perspectives to build shared understanding and alignment.

Method	*Purpose*	*Understand*	*Collaborate*	*Strategize*	*Innovate*	*Adapt*
Silent Signal	Explore how messages change without words	✓	✓			✓
Invisible Connections	Experience interdependence through movement	✓	✓			✓
Collective Pulse	Demonstrate self-organization without leadership	✓	✓			✓
Speed Framing	Expose bias by quickly reframing problems	✓	✓	✓	✓	
Invisible Negotiation	Reveal how hidden goals influence group behaviour and decisions	✓	✓		✓	✓
Ladder of Inference	Reveal how unconscious thinking shapes beliefs and actions	✓	✓	✓	✓	
Fishbowl Discussion	Facilitate inclusive group dialogue		✓			✓
Reverse Fishbowl	Practice adapting discussions under disruption		✓			✓
Stakeholder Mapping	Identify and prioritize key stakeholders	✓	✓	✓		
Cluster Map	Explore and connect ideas around a topic	✓	✓			
CATWOE Analysis	Clarify system purpose from multiple angles	✓	✓	✓		
Boundary Critique (BC)	Define and challenge system boundaries	✓	✓	✓		
Appreciative Inquiry	Identify and build on system strengths	✓	✓	✓		
World Café	Enable rotating conversations on shared topics		✓	✓		

Map: Understand and Visualize the System

This section focuses on methods that help practitioners explore, visualize, and map systems to gain deeper insights into their structures and dynamics.

Method	*Purpose*	*Understand*	*Collaborate*	*Strategize*	*Innovate*	*Adapt*
Air Circles	Show how perspective shifts change interpretation	✓	✓			
Adaptive Pen Control	Visualize interdependence, adaption, and dynamics	✓	✓			✓
Group Juggle	Explore how systems grow more complex	✓	✓			✓
Triangles	Show interdependence within systems	✓				✓
Live Systems Mapping	Physically map evolving system relationships	✓	✓	✓		✓
Bathtub Game	Visualize system accumulation and delays	✓				✓
DSRP Framework	Thinking patterns to understand complexity and make better decisions	✓	✓	✓	✓	✓
Behaviour Over Time Graphs	Plot and analyse variable trends over time	✓		✓		
Paper Computer	Identify influence patterns and leverage in complex systems	✓	✓	✓	✓	✓
Refrigeration Game	Experience how delays and local decisions cause instability	✓	✓			✓
Fishbanks Ltd.	Experience how individual actions and delays lead to resource collapse	✓	✓	✓		✓
Sankey Diagrams	Show flows of resources across systems	✓		✓		
System in Focus	Define the system, its boundaries, and external interactions	✓	✓	✓		✓
Rich Pictures	Capture complexity using visual storytelling	✓	✓			
Double Q-Diagram	Map hard and soft causes of problems to support balanced thinking	✓	✓	✓		✓
Impact Mapping	Align actions with strategic goals	✓	✓	✓		
Connected Circles	Reveal relationships between system variables	✓		✓		
Causal Loop Diagrams (CLD)	Identify feedback loops in systems	✓				
Systems Archetypes	Recognize patterns in system behaviour	✓		✓		✓
Leverage Point Mapping	Identify high-impact areas for systemic change	✓	✓	✓		✓
Scenario Planning	Plan for future uncertainties	✓	✓	✓		✓
World Game	Explore global challenges and interdependencies through cooperative, systems-based simulation	✓	✓	v	✓	✓
Soft Systems Methodology (SSM)	Explore messy, contested situations by comparing perspectives and finding meaningful change	✓	✓	✓		✓
Viable System Model (VSM)	Diagnose system structure and organizational viability	✓	✓	✓		✓

Make: Take Action and Create Solutions

This section covers methods that guide practitioners in moving from planning to execution, fostering innovation, and applying strategies to implement solutions effectively.

Method	*Purpose*	*Understand*	*Collaborate*	*Strategize*	*Innovate*	*Adapt*
Human Knot	Build teamwork and collaboration		✓			✓
Paper Airplane Factory	Simulate and improve processes		✓		✓	✓
Forced Prioritization	Rank and cut options under pressure		✓	✓		✓
Resource Tree	Map needed resources to reach a goal, clarify dependencies, and spot constraints	✓	✓	✓	✓	✓
Kano Model	Prioritize features based on user satisfaction		✓	✓	✓	
Theory of Constraints (TOC)	Identify and manage system bottlenecks	✓	✓	✓		✓
Prototyping Sprints	Rapidly test and improve early-stage ideas		✓		✓	
Process Hacking	Redesign broken processes for better performance	✓		✓	✓	
Backcasting	Plan strategically from future goals	✓		✓		✓
Synectics	Solve problems using analogies		✓		✓	
Morphological Analysis	Generate creative solutions	✓		✓	✓	
Futures Wheel	Map and evaluate long-term impacts	✓		✓	✓	✓

Manage: Evaluate and Adapt Over Time

This section highlights methods for overseeing processes, tracking performance, and adapting strategies to ensure continuous improvement and resilience within systems.

Method	*Purpose*	*Understand*	*Collaborate*	*Strategize*	*Innovate*	*Adapt*
Boom and Bust	Monitor and understand growth cycles	✓		✓		✓
Most Significant Change (MSC)	Capture significant outcomes and changes	✓	✓	✓	✓	✓
Outcomes Mapping	Track behavioural change and impact	✓	✓	✓		✓
Lag vs. Lead Indicator Tracking	Spot early signs vs. results	✓		✓	✓	✓
Balanced Scorecard	Measure and align strategic objectives			✓		✓
Iceberg Model	Reveal underlying system structures	✓				✓
Scenario Stress Testing	Test system response to shocks	✓	✓	✓	✓	✓
Fuzzy Cognitive Mapping (FCM)	Visualize and analyse causal relationships	✓				✓
Critical Systems Heuristics (CSH)	Evaluate system boundaries ethically	✓		✓		✓

Part 3

Apply 65+ Methods for Systems Practice

In this part, 65+ methods are introduced that support systems thinking in practice. Each method is designed to help individuals and teams better understand systems challenges, act more effectively within dynamic environments, and reflect on what works – and why. The methods are grouped into five focus areas (Motivate, Meet, Map, Make, and Manage) and are intended to be practical, adaptable, and easy to apply across a wide range of contexts.

Integration with Systems Thinking Principles

Each method builds on several core concepts of systems thinking introduced earlier in the book – such as interconnection, feedback, delay, and perspective (cf. Part 1). They are grounded in real-world practice, not just theory. The methods offer ways to translate systems thinking into action: making invisible structures more visible, helping teams surface assumptions, exploring boundaries, and testing decisions before they are made.

These methods offer step-by-step approaches to guide thinking and action, but they are not rigid templates. Each one can and should be adjusted to fit the people, challenges, and context at hand. They are meant to support flexible, adaptive practice, not impose fixed routines. Think of them as scaffolds: they provide structure, but you choose how to build with them.

You can adapt them for quick sessions or extended projects, apply them individually or in combination, and use them across many settings: education, policy, organizations, communities, and more. They support both solo reflection and collaborative work.

By offering methods that can be applied to real design and decision-making challenges, this chapter supports more structured action and continuous learning.

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What's in Each Method

Each method is presented in a consistent format:

- *Purpose: What the method helps participants achieve.*
- *How It Works: The underlying process and logic.*
- *Applications: When and where the method is especially useful.*
- *Exercise: How to run the method in practice.*
  - *Participants/time/equipment/space*
  - *Setup*
  - *Instructional steps*
- *Tips for Facilitators: How to run the exercise effectively.*
- *Tips for Debriefing: How to reflect and guide learning after the exercise.*
- *Variations: Optional adaptations for different situations.*

Together, these methods offer a flexible set of approaches for systems practice. Each method is described with clear steps and structure, based on principles that support effective learning and group work. But the steps are not fixed rules. As a facilitator, you can adjust, skip, or reorder parts depending on the situation. The goal is to support clear thinking, bring in diverse perspectives, and guide good decisions in complex situations.

Motivate

Why and What For?

Intervening in a system is not just about fixing problems; it is about disrupting the structures that create and sustain them. Many interventions fail by addressing symptoms rather than deeper forces. Before acting, it is critical to understand both why intervention is necessary and what for – clarifying motivation and purpose.

"Why" and *"What for"* serve different but complementary purposes:

- *"Why"* questions look backward, helping to uncover the causes, motivations, and justifications for action. They help clarify the reasons to intervene and assess whether the timing and approach are appropriate.
- *"What for"* questions look forward, focusing on the purpose, function, and intended outcomes of your intervention. They ensure that your actions align with the broader goals of the system and address the right issues.

Some systems persist despite being harmful because they serve certain interests, are reinforced by policies, or are protected by cultural norms. Others remain unchanged because the risks of intervention seem greater than the risks of maintaining the status quo. Without understanding both the reasons for intervention and the purpose it serves, your actions may be misdirected or ineffective.

Use "why" and "what for" questions early in the intervention process – during problem diagnosis, strategy development, and stakeholder engagement – to build a shared understanding of both the justification and purpose of your actions. Encourage participants to reflect on these questions individually and collectively to ensure clarity and alignment.

The following questions support participants in justifying and defining a strategic intervention:

***"Why"* questions:**

- *Why is intervention necessary?*
- *Why does the system resist change?*

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- *Why intervene now?*
- *Why are we the ones to intervene?*
- *Why this approach?*

***"What for"* questions:**

- *What is this intervention for?*
- *What purpose does it serve?*
- *What function does it fulfil?*
- *What is the intended outcome?*

By thoroughly exploring both "why" and "what for" questions and assessing system readiness before moving into action, participants ensure that interventions are justified, timely, well-targeted, and positioned for meaningful impact.

Deciding to Act

Boundaries | Perspectives | Leverage Points

Purpose

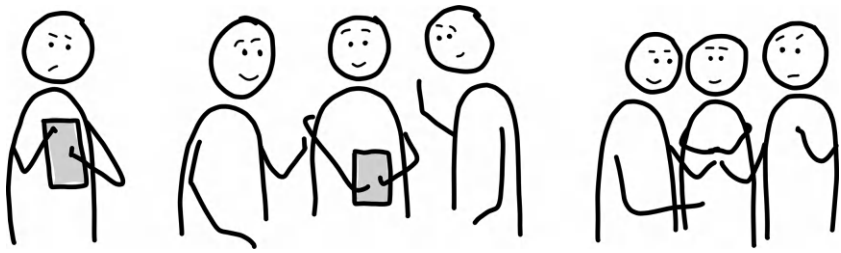
This exercise supports participants in critically assessing whether intervention is necessary and in clearly defining the real problem they seek to address. Instead of rushing into action, it encourages reflection on system resistance, urgency, risks of inaction, and possible impacts of change.

How It Works

Participants work individually or in small groups to examine a system they are involved with or wish to influence. They reflect on whether intervention is needed, who benefits from the current system, and what would happen if no action is taken. They then define the core problem, focusing on what must change and who is most affected.

Applications

This exercise is useful for system change teams, policymakers, leaders, and project groups starting new initiatives. It is especially helpful when there is uncertainty about whether to act or when previous interventions have failed.



Exercise: "Deciding to Act"

Participants	Time	Equipment
2–20	60–90 minutes	Paper, markers, sticky notes

Space : An open room with space for participants move around comfortably.

Setup

1. Participants work alone or in small groups.
2. Provide space for brainstorming and discussion.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain that this exercise helps test whether intervention is justified and defines the real issue to address.
   - Emphasize that disciplined thinking early on strengthens later interventions.
2. **Identify the system (15 minutes)**
   - Ask participants to select a system they are involved in or wish to change.
   - This could be an industry practice, organizational structure, or a social norm.
   - If participants are unsure, a *system mapping* can help clarify the system.
3. **Reflect on the need for intervention (15 minutes)**
   - List possible causes, not just symptoms. Name factors you can influence.
   - Individually, participants answer:
     i. Why intervene now?
     ii. What happens if no action is taken?
     iii. Who benefits from maintaining the current status quo?
4. **Frame the core problem (15 minutes)**
   - Encourage participants identify:
     i. What is happening what should not happen?
     ii. Who is most affected?
     iii. What would success look like?
5. **Small group sharing and refinement (10 minutes)**
   - Small groups work together to create a combined "Why and What" statement linking the need for action and the core problem definition.
   - **Example:** *"We believe intervention is necessary because [reason why now]. If nothing changes, [risk or harm will increase]. Currently, [describe the problem]. This affects [who is harmed]. Success would mean [what changes]."*
6. **Debriefing (15 minutes)**
   - Ask participants to share their insights with the group.
   - Facilitate a discussion on how clarity about motivation and problem framing strengthens system change efforts.

Tips for Facilitators

Encourage participants to critically reflect on both the need for intervention and the clarity of the problem. Remind them that it is better to delay action than to rush into a poorly defined challenge. Push them to ground their reflections in real-world systems rather than theoretical problems. Guide them to stay focused on current conditions and affected groups rather than jumping ahead to possible solutions. Help participants recognize that strategic timing and clear framing are essential foundations for effective interventions.

Tips for Debriefing

Create a space where participants can reflect on how their understanding of intervention and problem clarity evolved through the exercise. Use these questions to guide the discussion:

- What made deciding whether to intervene difficult or easy?
- How did framing the problem affect your thinking about possible actions?
- Were there disagreements about whether intervention was justified?
- What risks can arise from acting without a clear problem focus?
- How did connecting urgency and problem definition strengthen your plan for change?

Summarize key takeaways, focusing on how disciplined decision-making and clear framing create a stronger foundation for future interventions.

Variations

The "Deciding to Act" exercise can be adapted for different contexts, group sizes, or system challenges while maintaining its focus on strategic decision-making and clear framing.

- *Silent reflection:* Participants complete the full template individually before any group discussion to encourage deeper independent thinking.
- *Stakeholder perspective framing:* Groups create separate "Why and What" statements from the viewpoint of different key stakeholders to uncover hidden biases or conflicts.
- *Challenge and defend:* After drafting their statements, groups switch and critique another group's work, questioning assumptions and sharpening clarity.
- *Timing scenario:* Participants explore how the urgency of intervention might change under different future conditions (e.g., political shifts, social movements).
- *Combined decision wall:* Groups post their final statements on a wall and vote on which ones show the clearest justification and most focused problem framing.

Readiness Assessment

Boundaries | Perspectives

Purpose

This exercise helps participants assess whether a system is ready for intervention by analysing key factors such as stakeholder support, structural barriers, and timing. Instead of pushing change without understanding potential resistance, this method ensures that interventions are well-timed and positioned for impact.

How It Works

Participants evaluate a system's readiness for change using a structured assessment framework. They analyse factors like urgency, stakeholder alignment, resources, and external conditions. By scoring these elements, they identify whether an intervention is likely to succeed, needs more preparation, or requires a shift in approach.

Applications

This exercise is valuable for change-makers, policymakers, and teams working on complex transformations. It helps organizations avoid premature or ineffective interventions by ensuring that systemic conditions are favourable for change. Participants leave with a clearer understanding of whether to act now, build momentum, or adjust their strategy.

Exercise: "Readiness Assessment"

Participants	**Time**	**Equipment**
2–20	45–60 minutes	Paper, markers, sticky notes, assessment templates

Space : An open room with space for discussion and reflection.

Setup

1. Participants work individually or in small teams.
2. Provide assessment templates with key readiness factors.
3. Ensure space for discussion and scoring.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain that the goal is to assess whether the system is ready for intervention.
   - Encourage participants to approach the assessment critically rather than assuming action is always the next step.
2. **Identify Readiness Factors (10 minutes)**
   - Introduce key assessment criteria, such as the following:
     i. Urgency: Is there a pressing need for change?
     ii. Stakeholder Alignment: Are key actors supportive or resistant?
     iii. Resources: Are funding, knowledge, and capacity available?
     iv. External Conditions: Are policy, social, or market conditions favourable?
     v. Past Efforts: Have previous interventions succeeded or failed?
3. **Score the system (15 minutes)**
   - Participants rate each factor on a scale (e.g., 1–5) and discuss their scores.
   - High scores indicate readiness, while low scores suggest obstacles that need addressing before action.
4. **Analyse results (5 minutes)**
   - Facilitate a discussion on overall readiness.
   - Discuss where the system is ready, where gaps exist, and what steps could strengthen readiness.
5. **Debriefing (15 minutes)**
   - Reflect on how this readiness assessment shapes the planned intervention.
   - Encourage participants to consider timing, risks, and areas for preparation.

Tips for Facilitators

Encourage participants to be honest in their scoring rather than overly optimistic. Help them recognize that waiting and preparing can sometimes be more strategic than acting immediately. Push for evidence-based reasoning, ensuring scores are backed by real conditions rather than assumptions. Guide discussions toward what can be done to improve readiness if conditions aren't yet favourable.

Tips for Debriefing

Create a space for critical reflection and strategic thinking. Use these questions to guide the discussion:

- What readiness factors scored the lowest, and why?
- How does readiness influence the likelihood of success?
- What would need to shift to increase system readiness?
- Are there risks in intervening too soon?
- If the system is not ready, what next steps can help prepare for intervention?

Summarize key takeaways, emphasizing that systemic change requires the right timing and that building readiness can be a valuable intervention itself.

Variations

Readiness Assessment can be adapted to different contexts, group sizes, or system challenges while maintaining its focus on systemic change.

- *Fast-track version:* Participants use a simplified three-category scale, e.g., "ready, needs work, not ready," for a quicker decision-making process.
- *Stakeholder perspectives:* Instead of assessing readiness from a single viewpoint, participants evaluate it from multiple system actors' perspectives (e.g., policymakers, funders, affected communities) to uncover potential misalignments.
- *Scenario-based readiness:* Participants test system readiness under different future scenarios (e.g., policy changes, economic shifts) to explore how external conditions might impact intervention success.
- *Barrier identification:* Rather than scoring readiness, participants identify the biggest obstacles to change and brainstorm targeted strategies to address them before moving forward.
- *Comparative readiness:* Participants assess multiple systems or potential intervention areas side by side to determine where action is most feasible and impactful.

Guiding Star and Near Star

Leverage Points | Perspectives

Purpose

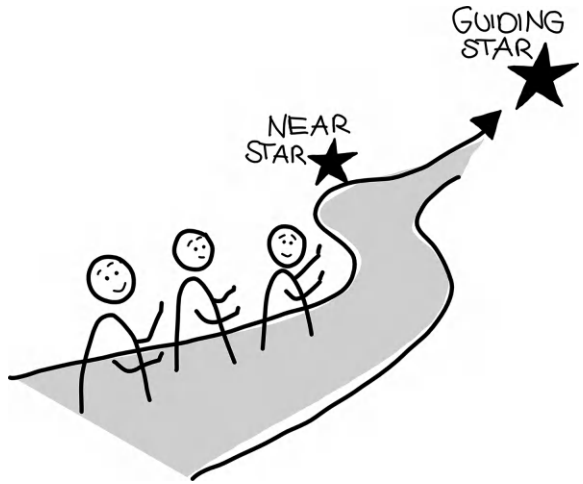
This exercise helps participants define a clear direction for systemic intervention by establishing a Guiding Star (long-term vision) and a Near Star (achievable milestone). By shifting focus from immediate fixes to systemic change, participants develop a structured, strategic approach. Instead of reacting to symptoms, this method encourages them to identify root causes and leverage points, ensuring that interventions are purposeful and impactful.

How It Works

Participants begin by envisioning a Guiding Star, a long-term vision that defines how the system should function if transformation is fully realized. They then establish a Near Star, a concrete and measurable milestone within 5–10 years that signals meaningful progress toward that vision. By clarifying both, participants create a bridge between ambition and action, ensuring that their intervention is both aspirational and achievable.

Applications

This exercise is ideal for teams working in policymaking, social impact, business transformation, and organizational change. It helps ensure that interventions are strategic, timely, and focused on deeper system shifts rather than temporary fixes. Participants gain clarity on why action is needed, how to measure progress, and what structural forces must be engaged to sustain long-term change.



Exercise: "Guiding Star and Near Star"

Participants	**Time**	**Equipment**
2–20	45–75 minutes	Paper, markers, sticky notes

Space **:** An open room with space for participants move around comfortably.

Setup

1. Participants work individually or in small teams.
2. Provide a workspace with flip charts, markers, or sticky notes for brainstorming.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain that this exercise helps participants define a long-term vision for system change (Guiding Star) and a key milestone toward it (Near Star).
   - Shift focus from short-term fixes to long-term system interventions.
2. **Define the Guiding Star (15 minutes)**
   - Participants describe the *ideal future state* of the system:
     What does a transformed system look like? What principles guide it, and how would people experience it differently?
   - *Prompt: "Our Guiding Star is a [name of system] that produces [desired condition]."*
   - *Example: "Our Guiding Star is a global supply chain that eliminates labour exploitation and ensures fair wages."*
3. **Define the Near Star (15 minutes)**
   - Participants identify a measurable milestone within 5–10 years:
     What structural, policy, or behavioural shift signals progress? What measurable outcome is achievable?
   - *Prompt: "Our Near Star is a [specific achievement] that enables [broader system improvement]."*
   - *Example: "Our Near Star is a corporate accountability standard that requires companies to verify fair wages across their supply chains."*
4. **Share and refine (15 minutes)**
   - Teams present their Guiding Star and Near Star to the group.
   - Facilitate discussion to refine clarity, alignment, and feasibility.
5. **Debriefing (15 minutes)**
   - Ask participants to reflect on challenges in defining the Guiding Star and Near Star and how it helps guide systemic interventions.
   - Facilitate a discussion on key next steps to move toward it.

Tips for Facilitators

Encourage participants to think beyond immediate solutions and focus on long-term system transformation. Guide discussions to ensure that both the Guiding Star and Near Star remain ambitious yet realistic. Push participants to refine their Near Star into a clear, measurable milestone that shows real progress. Keep the conversation grounded in systemic change rather than individual actions, and help participants identify key leverage points within the system.

Tips for Debriefing

Create a reflective space and encourage participants to connect the exercise with real-world system interventions. Use these questions to guide the discussion:

- What challenges did you face in defining your Guiding Star?
- Was it difficult to identify a Near Star that feels both ambitious and achievable?
- How does this approach shift your thinking about systemic interventions?
- What are potential barriers to achieving the Near Star, and how can they be addressed?
- What first steps can be taken to move toward the Near Star?

After gathering responses, summarize key takeaways, focusing on strategic direction, system evolution, and the balance between ambition and feasibility. Encourage participants to consider how these insights apply to their own interventions, organizations, or projects.

Variations

The Guiding Star and Near Star exercise can be adapted to different contexts, group sizes, or system challenges while maintaining its focus on systemic change.

- *Backcasting approach:* Instead of setting the Near Star first, participants work backward from the Guiding Star, identifying key milestones along the way.
- *Stakeholder perspectives:* Participants consider how different system actors (e.g., policymakers, businesses, communities) might define the Near Star differently.
- *Multiple Near Stars:* Instead of defining just one, participants identify several Near Stars to map how different interventions contribute to the same long-term vision

Cynefin Framework

Boundaries | Perspectives

Purpose

The Cynefin Framework is a sense-making tool for classifying situations based on how cause and effect are perceived. It is used when the path forward is unclear and adaptive strategies are needed. The framework helps identify the nature of a situation to guide appropriate action in complex or uncertain systems.

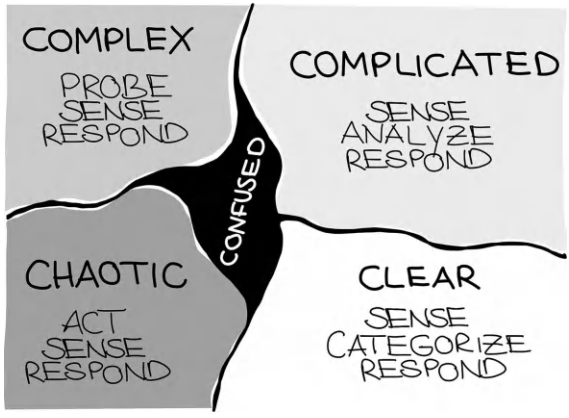
How It Works

Developed by Dave Snowden [49], the Cynefin Framework classifies situations into five domains depending on how predictable relationships appear at the time of assessment:

- *Clear:* Cause and effect are obvious; apply best practice.
  → *Sense – Categorize – Respond*
- *Complicated:* Cause and effect exist but require expert analysis.
  → *Sense – Analyse – Respond*
- *Complex:* Cause and effect only clear in hindsight; patterns emerge.
  → *Probe – Sense – Respond*
- *Chaotic:* No stability; immediate action is required to establish order.
  → *Act – Sense – Respond*
- *Confused:* Unclear situation; clarify which domain applies.

Applications

The Cynefin Framework is used in strategy, crisis response, policy, and organisational development. It supports decision-makers understand the context and choose how to act based on perceived complexity.



Exercise: "Cynefin Framework"

Participants	**Time**	**Equipment**
1–10	60–90 minutes	Large sheets of paper or whiteboards, markers

Space **:** A room with ample space for group discussion and visual brainstorming.

Setup

1. Set up large sheets of paper or whiteboards for group discussions.
2. Provide markers and reference materials for the Cynefin Framework.
3. Ensure space for breakout groups and group presentations.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the Cynefin Framework and its role in framing situations and guiding decision-making for different types of situations.
   - Provide an overview of the five domains: Clear, Complicated, Complex, Chaotic, and Confusion.
2. **Forming groups and initial discussion (10 minutes)**
   - Divide participants into small groups, and explain that they will use their experiences to identify examples for each Cynefin domain.
3. **Domain exploration (20 minutes)**
   - Guide each group to discuss and document examples from their own work or real-life situations that fit into each Cynefin domain.
   - Encourage groups to talk through their reasoning and identify why each example belongs in a specific domain.
4. **Group sharing and comparisons (20 minutes)**
   - Have each group present their examples and reasoning.
   - Facilitate discussion to compare differing perspectives and framings.
5. **Discussion and insights (15 minutes)**
   - Encourage participants to discuss any challenges they faced in categorizing situations and what insights they gained from the exercise.
   - Allow groups to adjust their examples or reasoning based on what they learned from others.
6. **Debriefing and application (15 minutes)**
   - Conclude with a reflection on how the Cynefin Framework applies to real-world decision-making and what steps to take next.
   - Discuss how participants can use their understanding of the framework and apply the suggested strategies.

Tips for Facilitators

Make sure participants understand each Cynefin domain before starting. Use real-world examples they can relate to. Encourage open, collaborative discussion and remind them there's no single right answer when categorizing complex situations. Step in only when needed; let groups lead their own analysis. Summarize key points now and then to keep focus.

Tips for Debriefing

Ask participants to reflect on their experiences with questions like the following:

- What insights were gained from framing situations into different Cynefin domains?
- How did using the framework change your approach to understanding problems and developing strategies?
- What lessons or takeaways can you apply to improve decision-making in complex or uncertain environments?

Encourage participants to share specific examples of how their thinking shifted and discuss potential applications of the framework in their work. Highlight any common themes or new perspectives that emerged during the exercise to help solidify understanding. This process supports integrating the Cynefin Framework into daily practices and underscores its importance in sense-making and strategic planning.

Variations

- *Simplified domain exploration:* Focus on only a few key domains for a more manageable session, ideal for beginners or short workshops.
- *Digital Cynefin workshop:* Leverage online collaboration tools, such as virtual whiteboards, for remote sessions where participants can engage and contribute their insights.
- *Case study analysis:* Use a shared real-world case study that participants can categorize and discuss, providing practical context for applying the framework.

Note

This framework was developed by Dave Snowden in the early 2000s [49]. The framework has continued to evolve over time, including refinements such a liminal zone and the aporetic state, introducing more nuanced distinctions. This version keeps the focus on practical application and accessibility.

Certainty-Agreement Matrix

Boundaries | Perspectives

Purpose

The Certainty-Agreement Matrix provides a practical tool to reflect on situations based on two dimensions: certainty and agreement. Use it when perspectives differ or the problem feels unclear. It is intended to support choosing suitable ways of working by framing the perceived clarity and alignment.

How It Works

The Certainty-Agreement Matrix uses two dimensions:

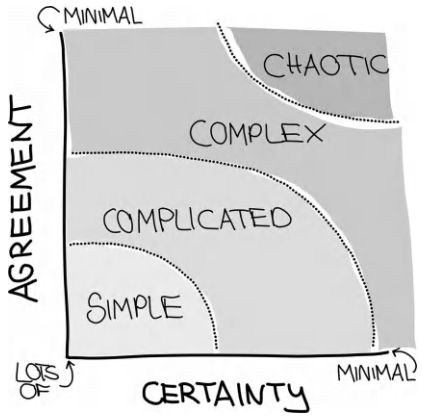
- *Certainty* – how well cause and effect are understood.
- *Agreement* – how much stakeholders align on goals or solutions.

Depending on where the situation falls, it suggests different modes of working:

- *Simple:* Cause and effect are clear; follow standard procedures.
- *Complicated:* Cause and effect are knowable but may require expert analysis; apply expert knowledge and planning.
- *Complex:* Cause and effect are unclear and evolve over time; experiment, observe patterns, and adapt.
- *Chaotic:* No clear cause and effect; act fast to stabilize then assess.

Applications

The Matrix is used in leadership, project planning, group facilitation, conflict resolution, and strategic decision-making. It helps teams reflect on how they perceive a situation and choose approaches that match those perceptions.



Exercise: "Certainty-Agreement Matrix"

Participants	**Time**	**Equipment**
10–30	60–90 minutes	Large sheets of paper or whiteboards, markers

Space **:** A room with enough space for group discussions and visual work.

Setup

1. Draw the Certainty-Agreement Matrix (two axes: Certainty and Agreement) on whiteboards or paper.
2. Provide markers and reference guides on the Certainty-Agreement Matrix for participants.

Instructional Steps

1. **Introduction (10 minutes)**
   - Explain the Certainty-Agreement Matrix and its purpose.
   - Walk through the four areas: Simple (high certainty, high agreement), Complicated (some uncertainty, but agreement), Complex (low agreement, some certainty), Chaotic (low agreement, low certainty).
2. **Forming groups and initial discussion (10 minutes)**
   - Break participants into small groups.
   - Brief them on brainstorming real-world situations and placing them onto the matrix.
3. **Mapping exercise (20 minutes)**
   - Groups discuss examples and decide where they fit on the matrix.
   - Encourage them to talk through why they chose specific spots.
4. **Group sharing and comparisons (20 minutes)**
   - Each group presents their map.
   - Facilitate discussion around different interpretations and placements.
5. **Discussion and insights (15 minutes)**
   - Ask participants about challenges in placement and new insights gained.
   - Allow groups to move examples if they change their mind after discussion.
6. **Debriefing and application (15 minutes)**
   - Reflect on the usefulness of the Certainty-Agreement Matrix for decision-making.
   - Discuss ways participants can use the matrix in everyday situations at work.

Tips for Facilitators

Ensure participants understand the Certainty and Agreement axes before starting. Use simple, relatable examples to illustrate the different zones. Emphasise that not all situations fit neatly, and differing views are part of the process. Let groups explain their reasoning and guide rather than provide answers. Summarize key points to maintain focus. Encourage open questioning and exploration.

Tips for Debriefing

Ask participants reflective questions such as the following:

- What did you learn from placing situations onto the Certainty-Agreement Matrix?
- How did thinking about Certainty and Agreement affect your understanding of the problems?
- What changes would you make to how you approach decision-making after this exercise?

Encourage participants to share real examples of shifts in thinking. Highlight surprising insights or common patterns. Discuss how complexity and uncertainty affect leadership and planning. Emphasise that the Certainty–Agreement Matrix can be used regularly in strategy or project sessions to build confidence in navigating complex, uncertain situations.

Variations

- *Whole group mapping*: Have everyone work together on one large matrix to encourage shared discussion and diverse examples.
- *Digital session*: Use online whiteboards like Miro or Jamboard for remote workshops; participants can map situations together in real time.
- *Case study*: Use a real-world scenario for participants to practice placing examples on the matrix.
- *Regular use*: Bring the matrix into regular meetings or reviews to help teams recognize and adapt to different problem types.

Note

This activity is based on concepts introduced by Ralph D. Stacey in the 1990s [88]. The version used here – with labelled areas like “Simple,” “Complicated,” “Complex,” and “Chaotic” – is an adaptation developed later by practitioners in leadership, systems thinking, and agile. Stacey did not present the model in this exact form. It’s not a diagnostic tool but a reflection aid to explore how a group sees a problem.

Power Mapping

Perspectives | Boundaries | Leverage Points

Purpose

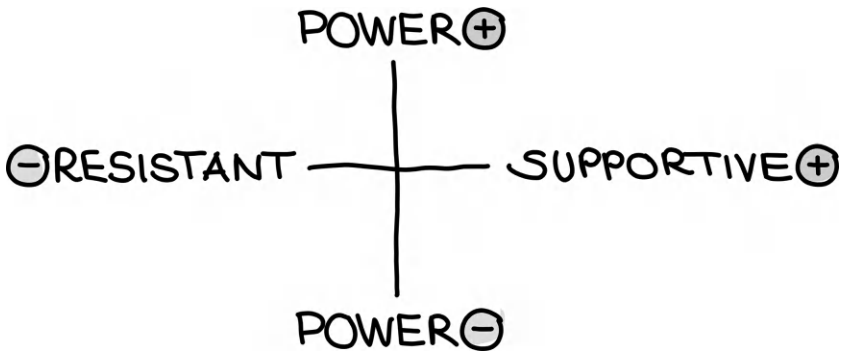
This exercise helps participants analyse power structures within a system by mapping key actors, their influence, and their relationships. Instead of assuming change happens through direct action alone, participants uncover who holds power, who resists change, and where influence can be leveraged to drive systemic transformation.

How It Works

Participants create a power map by identifying stakeholders within a system and categorizing them based on their level of influence and stance toward change. They then assess power dynamics to reveal where interventions should focus – whether through collaboration, persuasion, or pressure.

Applications

Useful for policymaking, advocacy, business transformation, and organizational change, this method ensures interventions target the right decision-makers. By understanding who controls the system and how influence flows, participants develop more effective strategies for engagement and action.



Exercise: "Power Mapping"

Participants	Time	Equipment
2–20	45–60 minutes	Paper, markers, sticky notes, flip charts

Space : A room with space for small teams to work and visualize their power map.

Setup

1. Participants work individually or in small groups.
2. Provide flip charts, sticky notes, and markers.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the goal: map power to see who enables or blocks change.
   - Encourage looking beyond formal roles to hidden power dynamics.
2. **Identify key stakeholders (10 minutes)**
   - Participants list all relevant actors in the system (e.g., policymakers, corporations, funders, media, grassroots organizations).
   - They write each stakeholder on a sticky note.
3. **Map power and support (15 minutes)**
   - Draw a 2 × 2 matrix with axes:
     i. Y-Axis: Power (Low vs. High)
     ii. X-Axis: Support for Change (Resistant vs. Supportive)
   - Participants place stakeholders on the matrix based on their perceived power and attitude toward change.
4. **Analyse power relationships (15 minutes)**
   - Discuss who holds the most power and who can influence others.
   - Identify potential allies to engage and key opponents to address.
   - Explore indirect paths to influence, such as leveraging media, public opinion, or partnerships.
5. **Strategize next steps (10 minutes)**
   - Participants develop a strategy to engage stakeholders based on their position in the power map.
   - Discuss how to shift neutral or resistant actors toward support.
6. **Debriefing (15 minutes)**
   - Ask participants to reflect on challenges in mapping power and insights gained about system influence.
   - Facilitate a discussion on key next steps to move toward it.

Tips for Facilitators

Encourage participants to look beyond formal structures and consider hidden influence, such as social networks, funding flows, or cultural norms. Focus on how power operates, not just who holds it. Keep discussion practical and strategic, identifying realistic ways to engage. Emphasize that shifting influence takes alliances, timing, and targeted action.

Tips for Debriefing

Create a reflective space where participants can challenge their assumptions about power dynamics and discuss how their understanding evolved. Use these questions to guide the discussion:

- What unexpected sources of power emerged in your map?
- What informal power structures exist within the system?
- Where do opportunities for leverage or coalition-building exist?
- How can indirect influence (e.g., public opinion, media, advocacy) shift power balances?
- What barriers might prevent engaging with key power holders, and how can they be addressed?

After gathering responses, summarize key takeaways, emphasizing the importance of understanding power relationships before taking action. Encourage participants to use their power maps to inform engagement strategies in real-world interventions.

Variations

The Power Mapping exercise can be adapted to different contexts, goals, and group dynamics while maintaining its focus on understanding influence in systems.

- *Power shifts over time:* Create two maps – one for the current system, one for a desired future state. Identify which actors need to gain or lose influence for change to happen.
- *Hidden power networks:* Focus on behind-the-scenes influencers, informal networks, and cultural forces rather than formal structures. Reveal unexpected leverage points.
- *Influence pathways:* After mapping actors, draw connections to show how influence flows. Brainstorm indirect strategies like media, coalitions, or policy shifts to shift power.
- *Crisis scenario mapping:* Simulate a disruptive event (e.g., leadership change, policy shift) and update the map. Prepare adaptive strategies based on possible system shifts.

Meet

Engage Stakeholders and Perspectives

Intervening in systems isn't just about understanding problems or designing strategies. It also means engaging with the people inside the system – those who drive it, resist it, shape it, and live with its consequences. Systems are made of actions, relationships, and decisions. Before planning any intervention, it is essential to engage with the people who hold different parts of the system view.

Many interventions fail because they focus only on structures or abstract models and overlook the human dynamics that shape the system. Systems are sustained by people's interests, fears, habits, and goals. Real change becomes possible when different perspectives are acknowledged, assumptions are surfaced, and shared understanding is built. Stakeholder engagement isn't a separate step; it is part of the system itself.

Some stakeholders will support change; others may resist because they benefit from the current state or fear uncertainty. Some hold informal or hidden power that isn't visible at first. Others have goals they won't state openly. Ignoring these dynamics can lead to resistance, failure, or unintended harm.

This section offers methods to supports practitioners encounter the system as it really is: messy, diverse, and human. Through movement, silence, mapping, and dialogue, it is possible to observe how systems behave when different interests and interpretations interact. It is about noticing not just what people say but also how relationships shift and patterns emerge.

Before designing solutions, it is essential to slow down and listen. Systems are shaped by people – their relationships, communication, and tensions. To intervene in a system, we must first recognize and understand these patterns.

Meaningful impact begins by meeting the system well.

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Silent Signal

Feedback Loops | Emergence | Nonlinearity

Purpose

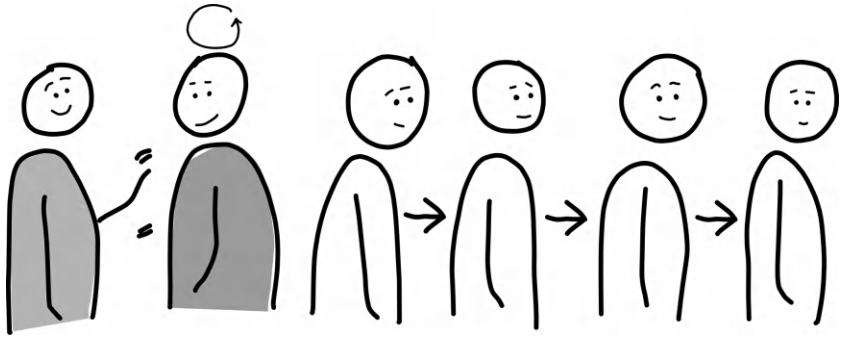
Silent Signal is an exercise that explores how information changes as it moves through a system. By relying solely on non-verbal communication, participants experience how messages evolve, distort, or adapt in unexpected ways. This activity highlights the challenges of clarity, interpretation, and feedback loops in complex systems.

How It Works

Participants stand in a silent line, facing the same direction. One person starts a gesture. They tap the person in front of them, who turns around, watches the gesture, then turns forward and repeats it for the next person. This continues down the line, with no talking. As the gesture is passed along, it often changes, showing how communication can shift as it moves through a group.

Applications

This method is useful in leadership training, team-building, and systems thinking workshops. It helps teams recognize the limitations of communication, understand feedback loops, and explore the dynamics of emergent change within organizations and social systems.



Exercise: "Silent Signal"

Participants	**Time**	**Equipment**
5–100	15–30 minutes	none

Space **:** A room with enough space for participants to stand in a line or circle.

Setup

1. Arrange participants in a line, all facing the same direction. This prevents anyone from seeing the gesture before their turn. A circle can also work, but make sure only one person sees the gesture at a time.
2. Explain that no talking is allowed during the exercise.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose of the activity: to explore how messages change through non-verbal communication.
   - Provide real-world examples where information shifts and distorts over time (e.g., organizational rumours, telephone game, misinterpretations in written vs. spoken communication).
2. **Passing the signal (10–15 minutes)**
   - One participant starts by performing a simple, silent gesture (e.g., a hand movement, head nod, or body motion).
   - They tap the next person, who turns around, watches the gesture once, then turns forward and passes it on the same way.
   - This continues through the group until the gesture reaches the last person.
3. **Observation (5 minutes)**
   - Compare the final gesture to the original movement.
   - Highlight noticeable changes and differences.
4. **Debriefing (10–15 minutes)**
   - Discuss how and why the gesture evolved throughout the process.
   - Facilitate a discussion about communication, feedback loops, and interpretation.

Tips for Facilitators

Encourage participants to focus on careful observation rather than perfect replication. Remind them that small changes are expected and part of the learning process. Observe how the gesture evolves and guide discussions on what influenced these changes. Highlight the role of assumptions, perception, and unintended distortions in communication.

Tips for Debriefing

Create an open discussion to explore the communication challenges participants experienced. Use guiding questions such as the following:

- How did the final gesture differ from the original?
- What factors contributed to the changes?
- How does this relate to real-world communication and feedback loops?
- What strategies can help improve clarity in non-verbal or indirect communication?

Summarize key insights and encourage participants to connect these learnings to team collaboration, leadership, and system feedback.

Variations

Silent Signal can be adapted for different contexts and learning objectives:

- *Fast vs. Slow*: Run the exercise at different speeds to see how time pressure affects accuracy.
- *Multiple Signals*: Introduce two or more gestures simultaneously to compare how different messages evolve.
- *Observer Role*: Have a few participants observe from the outside and analyse where changes occur.
- *Remote Adaptation*: Use video calls where participants pass a gesture sequentially in breakout rooms.

Note

This activity draws on classic non-verbal communication games (like the "Chinese Whispers" or "Telephone Game") but is adapted here to highlight feedback and emergence in system dynamics.

Invisible Connections

Interconnectedness | Emergence

Purpose

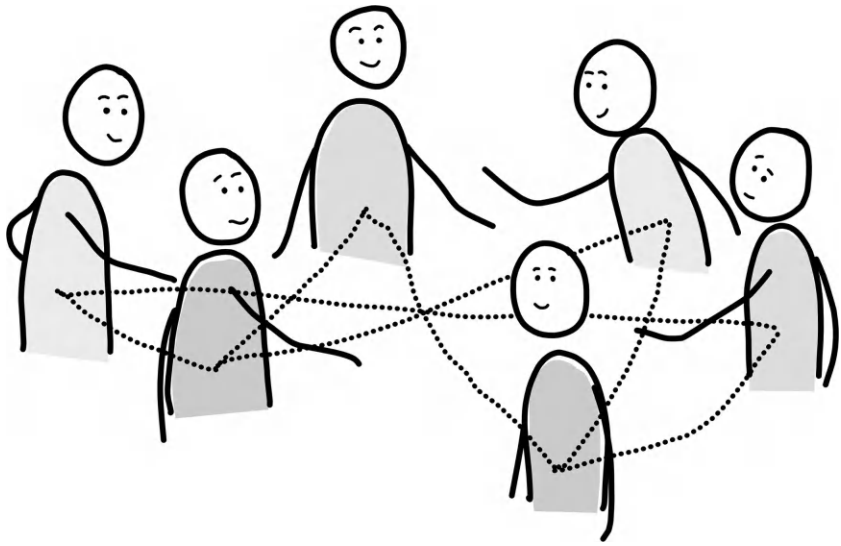
This exercise helps participants experience interdependence in a system. It illustrates how small changes can create ripple effects across a group, similar to the way shifts in organizations, ecosystems, or social dynamics influence outcomes.

How It Works

Participants move freely around the space. Each person secretly chooses two other people as their reference points. When either of those two moves, they respond with a small movement of their own. As people react to each other, changes ripple across the group in unexpected ways.

Applications

This activity is useful in leadership training, team-building, change management, and systems thinking workshops. It helps participants understand how interconnected actions influence outcomes, making it valuable for complex problem-solving and organizational strategy sessions.



Exercise: "Invisible Connections"

Participants	Time	Equipment
5–30	10–20 minutes	none

Space : An open area where participants can move freely.

Setup

1. Ensure participants have enough space to move without obstruction.
2. Explain the rules clearly before starting.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose: to demonstrate interdependence in systems.
   - Provide real-world examples where small changes lead to widespread effects (e.g., supply chains, social networks, or team dynamics).
2. **Choosing a reference point (1 minute)**
   - Each participant silently selects two other people as their reference points.
   - They do not reveal their choices to anyone.
3. **Movement phase (5–10 minutes)**
   - On the facilitator's signal, participants begin observing their two reference points.
   - When either of their chosen people moves, they respond with a small movement of their own.
   - There is no turn-taking; movements ripple through the group as people react.
   - Encourage slow, clear movements to help others notice and respond.
4. **Observation (5 minutes)**
   - Pause the movement and ask participants to describe what they noticed.
   - Highlight how small individual changes affected the entire group.
5. **Debriefing (10 minutes)**
   - Discuss how small changes affected the entire system.

Tips for Facilitators

Encourage participants to remain silent during the activity to heighten awareness of movement patterns. If movement slows down, remind participants to refocus on their reference points and adjust accordingly. Observe emerging patterns and use guiding questions to help participants connect their experience to real-world systems. During discussions, emphasize the importance of small changes within interdependent structures.

Tips for Debriefing

Create a reflective space for discussion. Ask participants to consider how their movements influenced others and what this reveals about interdependent systems. Use questions such as the following:

- How did one person's movement affect others?
- How does this relate to real-world systems?
- Can you think of a situation where small changes created widespread effects?
- What strategies can help manage interdependence in teams or organizations?

Summarize key insights from the discussion and encourage participants to connect these learnings to practical applications in teamwork, leadership, and decision-making.

Variations

Invisible Connections can be adapted for different contexts and learning objectives:

- *Speed challenge*: Repeat the exercise at different speeds to explore how rapid changes impact system stability.
- *Obstacles*: Introduce physical barriers to simulate constraints within a system.
- *Multiple reference points*: Increase complexity by having participants choose three or more reference points.
- *Remote adaptation*: Use online collaborative tools to simulate movement digitally, allowing remote teams to participate.

Note

This activity draws on complexity-based learning exercises commonly used in systems practice. Variants have appeared under names like "Web of Connections," "Invisible String," or "Relationship Web" in facilitation and complexity workshops to illustrate interdependence and emergent behaviour.

Collective Pulse

Emergence | Interconnectedness | Nonlinearity

Purpose

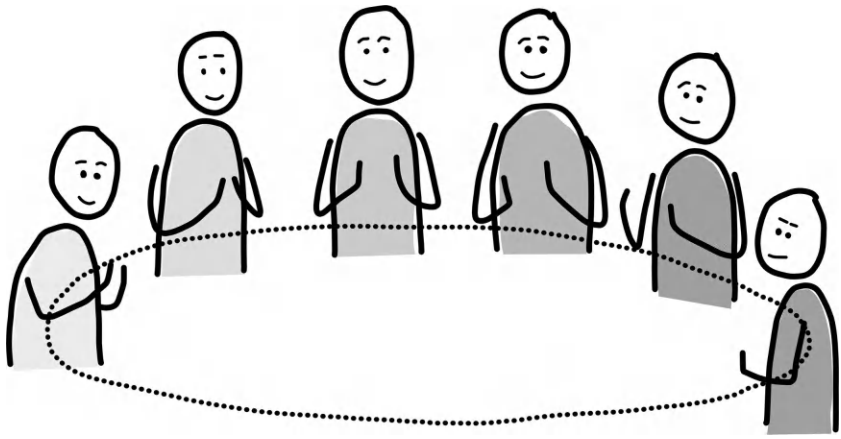
Collective Pulse is an exercise that demonstrates self-organization and group coordination without a designated leader. By relying on active listening and adaptation, participants experience how synchronization naturally emerges in a system without central control.

How It Works

Participants form a circle, close their eyes, and attempt to establish a shared rhythm (e.g., clapping, tapping feet). No one leads. The group must listen, adjust, and adapt until they naturally synchronize.

Applications

This method is useful in leadership training, systems thinking, and team-building exercises. It helps teams understand decentralized decision-making, collective intelligence, and emergent coordination – key concepts in complex systems, agile work environments, and social structures.



Exercise: "Collective Pulse"

Participants	Time	Equipment
5–30	15–20 minutes	none

Space : A quiet room with enough space for participants to form a circle.

Setup

1. Arrange participants in a circle, with enough space to move freely.
2. Instruct participants to close their eyes and remain silent throughout the exercise.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose of the activity: to explore how synchronization emerges without central control.
   - Discuss real-world examples of decentralized coordination (e.g., birds flocking, crowd behaviour, traffic flow, or decentralized teams).
2. **Find collective rhythm (5 minutes)**
   - Instruct participants to begin making rhythmic sounds (e.g., clapping, tapping their feet, snapping fingers) at their own pace.
   - Encourage them to listen carefully to others and adjust their rhythm based on what they hear.
   - Over time, the group will naturally synchronize into a shared pulse.
3. **Observation and debriefing (10–15 minutes)**
   - Once the group synchronizes, allow them to continue briefly, then stop the activity and discuss their experience.

Tips for Facilitators

Encourage participants to fully rely on listening rather than visual cues. If the group struggles to synchronize, remind them to be patient and adjust their rhythm based on what they hear. Observe the points where synchronization starts to emerge and facilitate a discussion on how self-organization happens.

Tips for Debriefing

Guide participants to reflect on their experience with synchronization. Use guiding questions such as the following:

- How did the group move from chaos to a shared rhythm?
- What strategies helped the group find synchronization?
- How does this relate to real-world systems where coordination emerges naturally?
- What lessons can be applied to teamwork, leadership, or decentralized decision-making?

Summarize key takeaways and encourage participants to connect these insights to practical situations in collaboration and adaptive systems.

Variations

Collective Pulse can be adapted for different contexts and learning goals:

- *Vary the rhythm*: Change the tempo or switch between different types of sounds to explore adaptability.
- *Silent pulse*: Instead of audible sounds, participants tap their hands on their legs, feeling the rhythm rather than hearing it.
- *Observer role*: Have some participants observe and note how synchronization emerges over time.
- *Remote adaptation*: Use an online platform where participants unmute their microphones one by one to find a shared rhythm digitally.

Note

This exercise is based on group rhythm and sensing practices used in facilitation and systems work. Similar versions appear in complexity workshops, improv training, and leadership exercises to explore self-organization and emergent coordination.

Speed Framing

Perspectives | Boundaries

Purpose

Speed Framing helps participants recognize how problem framing influences decision-making. By rapidly reframing a problem in multiple ways, teams uncover hidden biases, expand perspectives, and explore alternative solutions.

How It Works

Groups receive a problem statement and have two minutes to reframe it before passing it to another group.

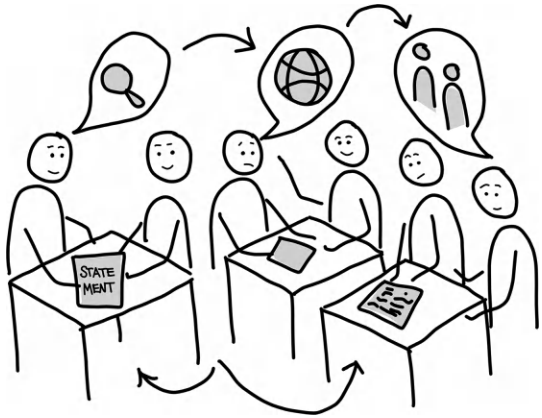
Example Statements

- "People don't recycle enough in our city."
- "Employee turnover is too high in our organization."
- "Public transport is unreliable and underused."
- "Young people are not engaging with local politics."
- "Energy costs are rising for small businesses."

Each team builds on or shifts the last framing. After several rounds, the final version is compared to the original to show how perspectives shape solutions.

Applications

This method is ideal for critical thinking, innovation, and problem-solving workshops. It helps teams break out of rigid mindsets, recognize cognitive biases, and develop more flexible approaches to complex challenges.



Exercise: "Speed Framing"

Participants	**Time**	**Equipment**
6–30 (in groups of 3–5)	20–30 minutes	Paper, markers or pens

Space **:** A room with tables or an open area for groups to collaborate.

Setup

1. Prepare several *problem statements* relevant to the session's focus.
2. Divide participants into *small groups* of 3–5 people.
3. Provide each group with *one problem statement* written on a paper.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the importance of problem framing in shaping decisions and solutions.
   - Provide examples of how shifting a problem's wording can change perspectives and priorities.
2. **Speed framing rounds (15 minutes (e.g., 5 x 2 minutes))**
   - Each group reads their problem statement and has two minutes to reframe it. They may use these ideas:
     i. Different View?
     ii. Symptom or Cause?
     iii. Bigger or Smaller?
     iv. Reverse It?
     v. Time Travel?
   - The group writes their reframing below the original on the same sheet.
   - After two minutes, they pass it to the next group.
   - The next group builds on a previous version or reframes it from a new angle.
   - Repeat for several rounds (typically 3–5), adding each version in sequence.
3. **Debriefing (15 minutes)**
   - Compare the final problem statements with the original versions.
   - Discuss how perspectives shifted and what this reveals about framing.

Tips for Facilitators

Encourage participants to experiment with different ways of reframing problems rather than refining a single version. Guide the discussion with prompts that challenge assumptions and expand perspectives. Use guiding questions such as the following:

- How would this problem look from a customer's perspective?
- How would a different industry or culture frame this issue?
- Can you make the problem broader or more specific?

Keep the activity fast-paced to prevent overthinking. The goal is to generate multiple perspectives quickly, not perfect solutions. Observe how different teams shift the problem focus and encourage creative framing approaches.

Tips for Debriefing

Create a space for open reflection and discussion. Ask participants to compare their final reframes with the original problem statement and consider the impact of shifting perspectives. Use guiding questions such as the following:

- Which reframing surprised you the most? Why?
- Did any frames introduce biases you hadn't considered?
- How can framing strategies help in team discussions or negotiations?
- What real-world problems could benefit from reframing exercises?

Summarize the discussion by emphasizing how problem framing influences decision-making, creativity, and group collaboration. Encourage participants to apply framing techniques in meetings, strategic planning, and problem-solving discussions.

Variations

Speed Framing can be adapted in small ways to shift the focus, add challenge, or better fit the group's needs:

- *Reverse framing:* Ask teams to intentionally make the problem worse before reframing it positively.
- *Thematic framing:* Each round, teams must reframe the problem using a specific lens (e.g., ethical, technological, financial).
- *Visual framing:* Instead of writing, teams sketch how the problem looks in each frame.
- *Silent framing:* Do one round without talking – teams must reframe silently on paper. Speeds up thinking and gives quieter participants space to contribute.

Invisible Negotiation

Emergence | Perspectives

Purpose

Invisible Negotiation explores how hidden agendas influence system behaviour and group decision-making. Participants attempt to achieve personal objectives while observing and adapting to others' actions, revealing how unseen motivations shape emergent group patterns.

How It Works

Each participant receives a pre-written goal card with one secret goal each.

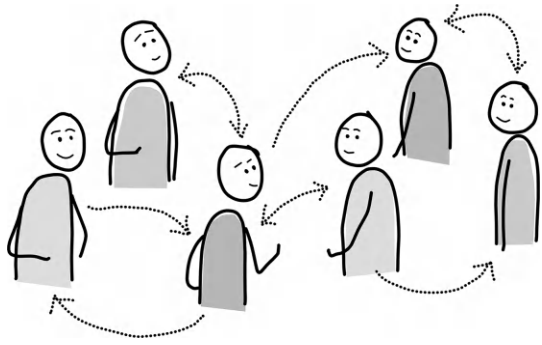
Example Goals

- "Stand near the wall / close to the centre of the room."
- "Avoid eye contact with anyone."
- "Follow one person around the room."
- "Keep moving. Don't stand still."
- "Form a group of three people around you."

Without speaking, they interact and adjust their behaviour to achieve their goal while interpreting the actions of others. Over time, patterns emerge, demonstrating how individual motivations impact group dynamics.

Applications

This method is valuable in leadership training, organizational development, conflict resolution, and systems thinking. It helps teams recognize how unspoken priorities influence decision-making and collaboration in complex systems.



Exercise: "Invisible Negotiation"

Participants	**Time**	**Equipment**
5–20	15–30 minutes	Pre-written goal cards

Space **:** A room with enough space for participants to move freely.

Setup

1. Prepare index cards with different secret goals (see earlier).
2. Distribute one goal card to each participant without revealing them to others.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose: to explore how hidden agendas influence system behaviour.
   - Discuss real-world examples where personal goals shape group interactions (e.g., corporate negotiations, politics, social dynamics).
2. **Silent interaction (10 minutes)**
   - Participants move around the space, silently attempting to achieve their personal goals.
   - They observe and adapt based on the actions of others.
3. **Debriefing (15 minutes)**
   - Pause the exercise and discuss what patterns emerged.
   - Participants share their experiences and reflect on how unspoken motivations shaped group dynamics and decision-making.
   - Ask participants to consider how personal goals shaped their actions and responses.
   - How does this relate to real-world situations where people have unspoken objectives?
   - Summarize key takeaways, focusing on how unseen forces shape system behaviour and decision-making.

Tips for Facilitators

Encourage participants to stay engaged with their goals without making them too obvious. Observe how behaviours interact and shift as participants adjust to one another. Use guiding questions to help participants reflect on their experiences.

Tips for Debriefing

Create a positive environment for reflection. Ask participants to consider how hidden agendas influence communication and decision-making. Use questions such as the following:

- How did different goals interact with each other?
- What challenges did you face in achieving your goal?
- How do hidden agendas influence real-world systems, such as workplaces or negotiations?

Summarize the key insights from the discussion and encourage participants to consider how understanding hidden motivations can improve teamwork and leadership.

Variations

Invisible Negotiation can be adapted for different contexts and group sizes:

- *Conflicting goals*: Introduce objectives that directly contradict each other to highlight negotiation dynamics.
- *Group vs. individual*: Some participants receive collective goals, while others have personal objectives.
- *Power imbalance*: Assign hidden roles with different levels of influence to explore hierarchy in decision-making.
- *Remote adaptation*: Use online breakout rooms where participants interact through chat-based or video-based silent negotiation.

Ladder of Inference

Perspectives | Emergence | Feedback Loops

Purpose

Originally developed by Chris Argyris [89], Ladder of Inference helps participants become aware of how they move from observing facts to forming beliefs and taking action. It reveals how unconscious steps in thinking can cause miscommunication, false assumptions, and biased decisions in complex systems.

How It Works

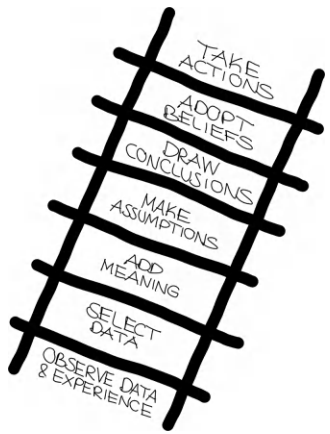
Participants are introduced to a simple model showing how people move from observation to action. Each ladder rung represents a thinking step, from raw data to behaviour:

- Observe Data and Experiences
- Selected Data
- Add Meaning
- Make Assumptions
- Draw Conclusions
- Adopt Beliefs
- Take Actions

Through discussion and examples, participants trace how their thoughts move up the ladder. Comparing interpretations shows how focus and assumptions shape different conclusions.

Applications

Useful in group dialogue, stakeholder engagement, conflict resolution, and systems thinking. It helps teams slow down their thinking, question assumptions, and listen more openly, especially before group decisions or mapping exercises.



Exercise: "Ladder of Inference"

Participants	Time	Equipment
2–20	30–50 minutes	Whiteboard or flip chart, markers, printed ladder diagram (optional)

Space : A room with space for seated discussion or small group work.

Setup

1. Draw the Ladder of Inference on a whiteboard or flip chart.
2. Prepare one or two short written statements or scenarios that could be interpreted in different ways.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain that people often jump from observing facts to forming beliefs and actions without realizing the steps in between.
   - Mention that this process can lead to misunderstanding, bias, and conflict.
2. **Present the ladder (10 minutes)**
   - Introduce the seven steps of the Ladder of Inference: Reality and Facts, Selected Data, Added Meaning, Assumptions, Conclusions, Beliefs, and Actions.
   - Briefly describe each step.
3. **Group example (10 minutes)**
   - Read a short neutral scenario (e.g., "A colleague leaves a meeting early").
   - Ask participants: What might someone conclude from this?
   - As participants respond, map their thoughts onto the ladder.
4. **Paired or small group reflection (10 minutes)**
   - Have participants recall a time they made a quick judgment.
   - In pairs or small groups, they take turns mapping their thinking process on the ladder.
5. **Debriefing (15 minutes)**
   - Gather insights: How did different people move through the ladder?
   - Discuss assumptions made and how different interpretations emerged.
   - Reflect on how becoming aware of the ladder can support better dialogue and decision-making.
   - Ask how this tool might apply in real-world settings, like teams, communities, or negotiations.

Tips for Facilitators

Encourage participants to be honest and specific when tracing their thinking. Use simple examples and real situations that are familiar to the group. Watch for skipped steps or fast assumptions and gently guide participants back down the ladder to uncover what was actually observed.

Tips for Debriefing

Create space for open reflection without judgment. Use guiding questions to help participants notice how their thinking shifted:

- Where did you jump from observation to assumption?
- Did others interpret the same situation differently?
- What step happened so fast you didn't notice it at first?
- How might this affect your communication or decision-making in teams?

Encourage participants to apply this awareness in conversations, planning, and conflict situations.

Variations

Ladder of Inference can be adapted for different settings and goals:

- *Visual version:* Provide printed ladder diagrams for each participant to write on during the session.
- *Personal mapping:* Ask individuals to reflect on a recent decision and map their ladder privately.
- *Group mapping:* Use sticky notes to build a shared ladder in response to a group event.
- *Conflict unpacking:* Use the ladder in tense situations to unpack diverging viewpoints.

Fishbowl Discussion

Perspectives | Boundaries | Feedback Loops

Purpose

The Fishbowl Discussion method fosters open and inclusive group discussions. It allows participants to share their perspectives in a structured environment while others observe and listen. This format encourages active participation, ensures quieter voices are heard, and promotes deeper understanding through dialogue.

How It Works

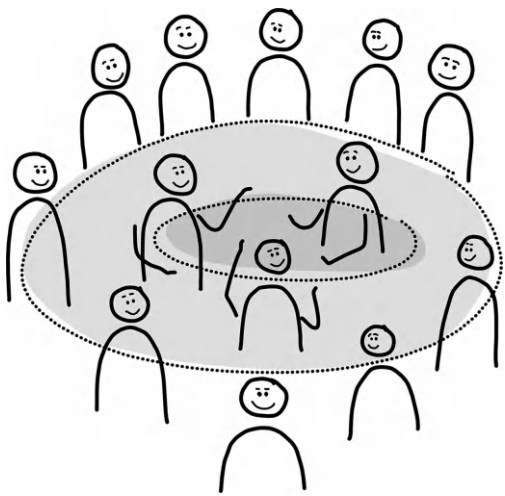
Participants are arranged in two concentric circles:

- The inner circle discusses a topic.
- The outer circle listens.

Over time, participants rotate between speaking and observing roles, ensuring that all voices have a chance to be heard. This method is ideal for managing larger group discussions and ensuring balanced participation.

Applications

This technique is useful in team-building, educational settings, community engagement, and organizational development. It encourages critical thinking, listening skills, and inclusivity, making it suitable for discussions around complex or sensitive topics.



Exercise: "Fishbowl Discussion"

Participants	Time	Equipment
10–20	45–60 minutes	Chairs (for two concentric circles)

Space : A room with enough space to set up both circles for the discussion.

Setup

1. Arrange chairs in two concentric circles:
   - *Inner circle*: 3–6 chairs for active speakers.
   - *Outer circle*: Remaining chairs for observers.
2. Ensure enough space for participants to easily move between the circles.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose of the Fishbowl Discussion: to foster open dialogue while allowing participants to experience both speaking and listening roles.
   - Outline the rules: inner circle participants speak; outer circle participants observe.
2. **Choose a topic (5 minutes)**
   - Select an open-ended question or topic that encourages diverse perspectives. Ensure the topic is relevant to the group's focus.
3. **Start the discussion (10–15 minutes)**
   - Invite 4–6 participants to sit in the inner circle and begin discussing the topic.
   - Encourage open sharing of thoughts and experiences.
4. **Rotate participants (10–15 minutes)**
   - After a set time, signal for participants to rotate:
     i. Anyone in the outer circle who wishes to speak raises their hand.
     ii. When someone from the outer circle joins, one person from the inner circle moves to the outer circle.
5. **Continue the discussion (10–15 minutes)**
   - Allow the discussion to continue with new participants joining and rotating.
   - Ensure multiple voices are heard by rotating participants regularly.
6. **Debriefing (15 minutes)**
   - Bring everyone together for a debriefing session.
   - Ask participants to share insights gained from both speaking and observing.
   - Discuss key themes, patterns, and learnings from the conversation.

Tips for Facilitators

Encourage participants to actively listen and reflect on what is being said, ensuring that everyone gets an opportunity to speak. Keep the conversation balanced by gently reminding dominant speakers to allow space for others. Facilitate smooth rotations, and guide the discussion toward deeper reflections without steering it too much.

Tips for Debriefing

Create a positive space for participants to share their experiences. Use questions like the following:

- What did you learn from listening in the outer circle?
- How did your perspective change after speaking in the inner circle?
- Were there any recurring themes or surprising insights?
- How did the structure of the exercise influence the discussion?
- How can you apply what you've learned to future discussions or projects?

Encourage participants to consider how this structured format affected group dynamics and the inclusivity of the discussion.

Variations

Fishbowl Discussions can be adapted to fit different group sizes and contexts:

- *Multiple topics*: Rotate through different topics by changing the theme during each round, allowing for varied discussions on multiple issues.
- *Silent fishbowl*: Observers in the outer circle write down observations instead of speaking. After the discussion, these notes are shared with the group to provide additional insights.
- *Speed fishbowl*: Reduce the speaking time per rotation to encourage quicker exchanges and sharper reflections.
- *Remote fishbowl*: For virtual meetings, use breakout rooms or virtual "inner and outer circles" to simulate the Fishbowl format. Participants can rotate between listening and speaking roles using video conference tools.

Reverse Fishbowl

Feedback Loops | Perspectives | Boundaries | Emergence

Purpose

Reverse Fishbowl simulates real-world system disruptions by introducing external interventions into a discussion. Participants inside the fishbowl must adapt their conversation in real time as observers introduce unexpected challenges, perspective shifts, or new stakeholders.

How It Works

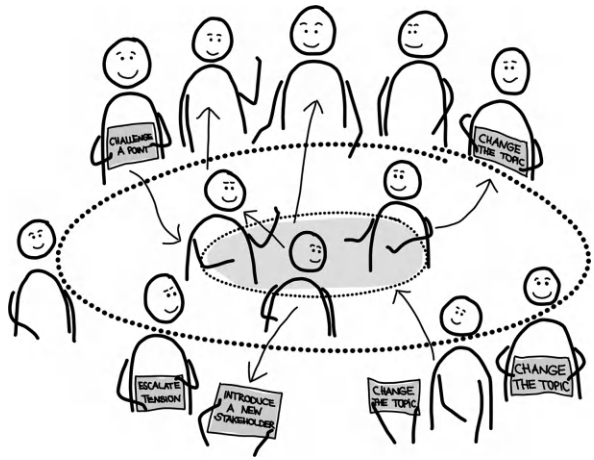
A small group engages in a structured discussion inside a fishbowl while observers outside hold "*intervention cards*" with prompts such as the following:

- Challenge a point: Disagree with a statement and explain why.
- Change the topic: Shift the discussion to a related but new focus.
- Introduce a new stakeholder: Add an unexpected perspective.
- Escalate tension: Push for a stronger argument or opposing view.
- Call for consensus: Force the group to align on a decision quickly.

At any moment, an observer can play a card (e.g., giving it to the inner circle), forcing the discussion to adapt. This method mirrors real-world conversations where external forces constantly reshape debates and decision-making.

Applications

This method is useful in leadership, systems thinking, policy, and conflict work. It helps participants build resilience, respond to shifts, and practice adaptive thinking under pressure.



Exercise: "Reverse Fishbowl"

Participants	Time	Equipment
6–20	30–45 minutes	Printed intervention cards, chairs for discussion circle

Space : A room with enough space for the discussion and observer group.

Setup

1. Arrange chairs in two concentric circles:
   - **Inner circle**: 3–6 chairs for active speakers.
   - **Outer circle**: Remaining chairs for observers.
2. Ensure enough space for participants to easily move between the circles.
3. Distribute the "intervention cards" for the observers.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose of Reverse Fishbowl: to simulate real-world conversations where external forces continuously reshape discussions.
   - Provide examples of dynamic discussions in politics, business, and social change where unexpected interventions required rapid adaptation.
2. **Fishbowl Discussions (15 minutes)**
   - A small group (3–6 participants) begins discussing a given topic in the fishbowl.
   - The observers hold intervention cards and, at any moment, can play one by announcing the change or by handing the card to the inner circle and explaining how the discussion must shift.
   - The participants inside the fishbowl must adapt their conversation accordingly while maintaining a logical discussion flow.
3. **Debriefing (15 minutes)**
   - Reflect on how interventions influenced the discussion.
   - Summarize key takeaways and encourage participants to consider how to navigate unpredictable discussions in their own work.

Tips for Facilitators

Encourage observers to be strategic about when they play intervention cards, ensuring they push discussions in meaningful ways rather than disrupting randomly. Use guiding questions to help them decide when to intervene:

- Is the discussion too comfortable or predictable?
- Would a new perspective challenge assumption?
- Does the discussion need more depth, clarity, or urgency?

Ensure that fishbowl participants remain engaged and do not become overwhelmed by rapid shifts. If necessary, allow short pauses between interventions to maintain discussion quality.

Tips for Debriefing

Create a reflective space where participants can assess how they handled disruptions. Guide discussions with questions such as the following:

- What types of interventions were the most challenging? Why?
- How does external influence impact real-world discussions and decisions?
- What skills are needed to navigate unpredictable conversations effectively?
- How can leaders and teams prepare for sudden shifts in discussions?

Encourage participants to connect this experience to meetings, negotiations, and leadership discussions, where unexpected changes require quick thinking and adaptability.

Variations

Reverse Fishbowl Discussions can be adapted to fit different group sizes and contexts:

- *Layered interventions*: Observers can stack multiple intervention cards at once, forcing participants to juggle multiple disruptions simultaneously.
- *Time-limited adaptation*: Participants must implement changes within 30 seconds of an intervention, increasing urgency.
- *Role-play stakeholders*: Assign observers specific stakeholder roles (e.g., CEO, activist, regulator), requiring them to intervene based on their assigned perspective.
- *Remote adaptation*: Use an online meeting platform where facilitators send interventions via chat messages, prompting discussion shifts in real time.

Stakeholder Mapping

Perspectives | Boundaries

Purpose

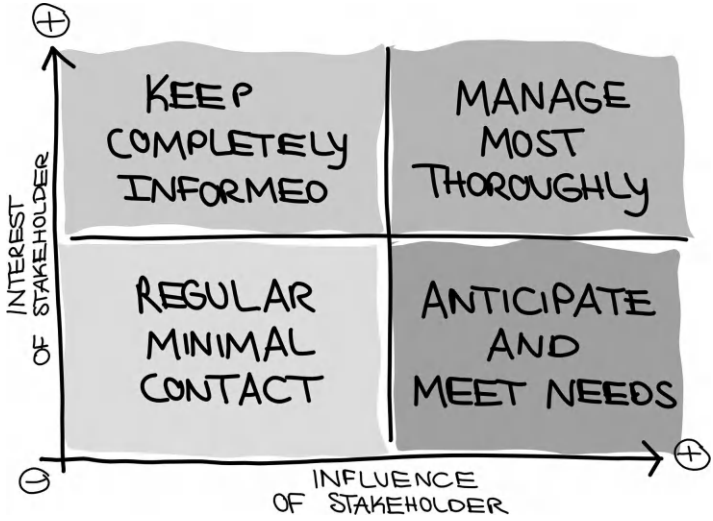
Stakeholder Mapping helps identify, analyse, and prioritizes stakeholders in a project or system. By mapping stakeholders based on their influence and interest, organizations can better understand their roles and manage relationships effectively. This method ensures that the needs of key players are addressed, supporting inclusive, sustainable outcomes.

How It Works

Participants use a large grid to plot stakeholders based on their influence and interest levels. Stakeholders are represented by sticky notes or index cards, which are placed collaboratively on the grid. Through discussion, the map is refined, enabling better decision-making and engagement strategies.

Applications

Stakeholder Mapping is widely used in project management, organizational change, public policy, and community planning. It helps teams engage with stakeholders, prioritize actions, and develop communication strategies, making it especially valuable for complex projects with diverse interests.



Exercise: "Stakeholder Mapping"

Participants	**Time**	**Equipment**
5–20	30–60 minutes	Large grid or chart paper, markers, sticky notes, or index cards

Space : A room with space for groups to work comfortably around a large grid or chart.

Setup

1. Prepare a large grid on chart paper or a whiteboard, divided into quadrants to plot stakeholders based on influence and interest.
2. Arrange markers, sticky notes, and other materials within easy reach.
3. Ensure enough space for groups to spread out and work comfortably.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose and value of Stakeholder Mapping in projects and decision-making.
   - Discuss examples of stakeholders and their potential influence and interest.
2. **Identifying stakeholders (10 minutes)**
   - Ask participants to brainstorm stakeholders and write them on sticky notes or index cards.
   - Place these notes on the grid without arranging them initially.
3. **Plotting stakeholders (10 minutes)**
   - Guide participants to place the sticky notes on the grid according to the stakeholders' influence and interest.
   - Encourage discussion around each placement to ensure group consensus.
4. **Analysing relationships (10 minutes)**
   - Encourage participants to draw lines or use markers to indicate relationships between stakeholders.
   - Discuss how these relationships might impact the project.
5. **Group presentations (15 minutes)**
   - Have each group present their stakeholder map to the rest of the participants.
   - Encourage questions and discussion to explore different perspectives.
6. **Debriefing (15 minutes)**
   - Reflect on how Stakeholder Mapping has helped participants better understand the project.
   - Ask participants to consider how the influence and interest levels of stakeholders affect decision-making.

Tips for Facilitators

Encourage open discussions when plotting stakeholders, ensuring participants consider indirect or hidden stakeholders. Use guiding questions to help participants reach consensus on stakeholder positions and relationships. During presentations, guide discussions toward actionable insights and stakeholder engagement strategies.

Tips for Debriefing

Create a positive environment for reflection. Ask participants to consider the key stakeholders identified and how their influence affects the project. Use questions such as the following:

- Who are the key stakeholders identified in your map?
- How do their influence and interest levels affect your project?
- Were there any surprising insights or relationships?
- How did mapping the stakeholders enhance your understanding of the system?
- How can these insights inform your engagement and communication strategies?

Summarize the key points from the discussion, focusing on the most important stakeholders and relationships. Encourage participants to connect these insights to real-world applications and set clear goals for follow-up actions.

Variations

Stakeholder Mapping can be adapted for different contexts and group sizes:

- *Individual maps*: For larger groups, participants can create individual stakeholder maps, then combine them into one comprehensive map.
- *Digital tools*: Use online tools to create stakeholder maps in remote settings, making collaboration easier.
- *Revisit and update*: For dynamic projects, periodically revisit the stakeholder map to adjust positions as relationships and influences evolve.
- *Hidden stakeholders*: Add a segment to identify indirect or less obvious stakeholders to ensure a more comprehensive analysis.

Note

Based on stakeholder analysis methods developed in strategic management [90] and later adapted into practical tools, such as the Influence-Interest Grid and Mendelow's Matrix.

Cluster Mapping

Interconnectedness | Emergence | Perspectives

Purpose

Cluster Mappings are used to explore and visualize various elements and their connections within a system. This method helps participants identify possible intervention points while reflecting the complexity of the system's elements and relationships. The chaotic appearance of the map mirrors the unstructured nature of systems, allowing insights to emerge organically.

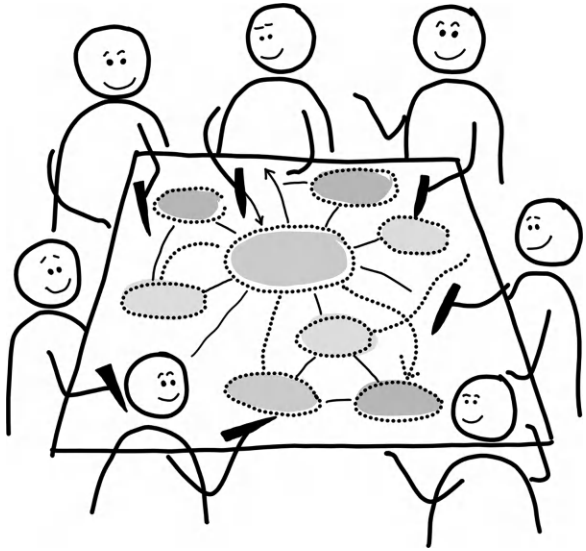
How It Works

Participants brainstorm elements related to a central topic and write them on a large sheet of paper. Using coloured markers, they create connections between these elements, allowing relationships and complexities to naturally emerge as they explore the system holistically.

Writing the main topic in the centre can be helpful but is not required. Let the structure follow the thinking – not the other way around.

Applications

Cluster Mappings are valuable in fields like education, public policy, and organizational development, where complex issues require a broad exploration. By mapping the connections, participants can identify key areas for further investigation or intervention.



Exercise: "Cluster Mapping"

Participants	Time	Equipment
5–20	60–90 minutes	Large sheets of paper Markers (different colours)

Space : A room with enough space for participants to spread out and work comfortably on large paper or a board.

Setup

1. Prepare large sheets of paper and coloured markers for each group.
2. Identify the main topic to be explored, and write it in the centre of the paper.
3. Ensure enough space for groups to spread out and work comfortably.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the purpose and significance of the Cluster Map.
   - Emphasize that it is exploratory and that there are no wrong ideas or contributions.
   - Emphasize that the map might become visually chaotic, reflecting the complexity of the topic.
   - Guide participants to embrace the confusion as part of the process.
2. **Brainstorming and writing (15 minutes)**
   - Ask participants to brainstorm all relevant elements related to the topic and write them on the large sheet of paper.
   - Encourage them to write freely without organizing or overthinking the relationships.
3. **Make connections (15 minutes)**
   - Ask participants draw connections between the different elements using lines.
   - Use different-coloured markers to represent different types of relationships (e.g., influence, control, or interdependencies).
4. **Group presentations (15 minutes)**
   - Have each group present their Cluster Map to the rest of the participants.
   - Encourage questions and discussions to explore different perspectives.
5. **Debriefing (15 minutes)**
   - Ask participants to reflect on what they learned from creating the map.
   - Encourage them to consider how connecting the elements changed their understanding of the topic.

Tips for Facilitators

Encourage participants to embrace the chaotic feel of the Cluster Map, and remind them that the confusion reflects the system's complexity. Ensure everyone contributes by adding their ideas and exploring different perspectives. During group presentations, guide discussions toward actionable insights and shared understanding.

Tips for Debriefing

Create a positive, reflective environment that encourages participants to consider the connections they discovered. Ask questions such as the following:

- What key elements stood out in your map?
- How did connecting these elements enhance your understanding of the system?
- Were there any surprising or unexpected relationships?
- What patterns or themes did you notice?
- How might different perspectives have influenced your Cluster Map?
- What new insights did this exercise provide about the system's complexity?
- How can these insights help inform future decisions or actions?

Summarize the main points from the discussion, highlighting significant relationships and patterns. Encourage participants to relate these insights to their real-world situations and identify specific, measurable steps they can take based on their new understanding.

Variations

Cluster Maps can be adapted for different group sizes and contexts:

- *Sticky notes*: Use sticky notes to allow for flexible movement of elements as relationships become clearer.
- *Subgroup focus*: Work in smaller subgroups on specific areas of the system, then combine findings into a larger map.
- *Virtual tools*: Use online whiteboards or mind-mapping apps in remote settings to collaborate digitally.
- *Ongoing mapping*: Revisit the Cluster Map throughout a project, adding new elements and connections as the system evolve.

Note

Cluster Mapping is inspired by the principles of Concept Mapping [91], using free-form structures to explore connections between ideas in a less hierarchical way.

CATWOE Analysis

Perspectives | Boundaries

Purpose

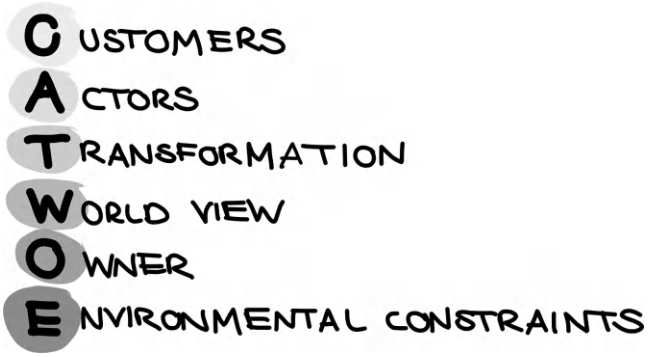
CATWOE is a structured tool used to define the core purpose of a system by examining it from six key perspectives. It helps participants clarify complex problems by analysing who is involved, what changes, and why the system exists.

How It Works

Participants use the CATWOE framework to explore different elements of a system. By looking at a problem from multiple angles, they can gain a deeper understanding of how systems function and identify key areas for improvement.

Applications

This method is ideal for problem-solving, project planning, and organizational development. It helps teams develop a shared understanding and focus on essential system elements. CATWOE was developed as part of Peter Checkland's Soft Systems Methodology (SSM) and is widely used in strategic thinking.



Exercise: "CATWOE Analysis"

Participants	**Time**	**Equipment**
5–15	30–60 minutes	Large sheets of paper or whiteboard, markers or pens, sticky notes (optional)

Space **:** A room with enough space for participants to collaborate and write their ideas on a shared surface.

Setup

1. Prepare a large sheet of paper or whiteboard displaying the *CATWOE framework*.
2. Provide markers for participants to write their ideas.
3. Define a system or problem the group will analyse.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain that CATWOE helps clarify a system's purpose through six perspectives.
   - Introduce each element of CATWOE:
     i. Customers (C): Who benefits from the system or is affected by it?
     ii. Actors (A): Who performs the key actions within the system?
     iii. Transformation (T): What inputs are being transformed into outputs?
     iv. Worldview (W): What bigger picture gives the system meaning?
     v. Owners (O): Who controls the system or has the power to change it?
     vi. Environmental Constraints (E): What external factors limit the system?
2. **Apply the framework (30 minutes)**
   - Invite participants to brainstorm and fill in each CATWOE category (e.g., work in subgroups or rotating groups).
   - Write responses for each element sticky notes.
   - Encourage open discussion for each element.
   - Note disagreements and interpretations; these often reveal system tensions.
3. **Write a root definition (10 minutes)**
   - Draft a one-sentence system description using the CATWOE inputs.
     Example prompt: "*This system, operated by [*Actor*], transforms [*input*] into [*output*] for [*Customer*]. It is based on the belief that [*Worldview*]. The system is controlled by [*Owner*] and operates within [*Environmental constraints*]."*
4. **Debriefing (15 minutes)**
   - Discuss the insights gathered from each CATWOE element.
   - Identify key areas for action or further investigation based on the different perspectives.

Tips for Facilitators

Encourage participants to explore all CATWOE elements thoroughly and challenge assumptions about the system. Use open-ended questions to prompt deeper thinking, such as the following:

- Who are the customers? Are we missing anyone indirectly affected?
- What transformation is happening? Can it be improved or adapted?
- Who controls the system? Are there hidden influences?
- What constraints exist? Could they affect future operation?

Facilitate balanced discussions that include all perspectives, ensuring that no single viewpoint dominates. Encourage participants to critically assess how these components interact and what happens when they change.

Tips for Debriefing

Create a space where participants feel comfortable reflecting on challenges. Guide the discussion with questions such as the following:

- What was the most difficult perspective to analyse? Why?
- How does the Worldview shape decision-making in this system?
- Were there conflicts between different perspectives? How were they resolved?
- How does this method compare to other problem-solving approaches?

Encourage participants to connect insights to real-world situations. Summarize key takeaways and help them identify next steps for applying CATWOE in their work.

Variations

CATWOE Analysis can be adapted to suit different group sizes, settings, and levels of experience:

- *Dynamic rotation:* Assign participants a CATWOE role, and rotate them through all perspectives, rewriting the problem each time.
- *Silent mapping:* Start with a silent round where participants jot down thoughts for each category before discussing.
- *Multiple systems:* Split into subgroups to analyse different systems, then compare how the focus shifts across types.
- *Scenario testing:* After analysis, test the system's resilience by introducing "what-if" scenarios like leadership changes.

Boundary Critique (BC)

Boundaries| Perspectives | Interconnectedness

Purpose

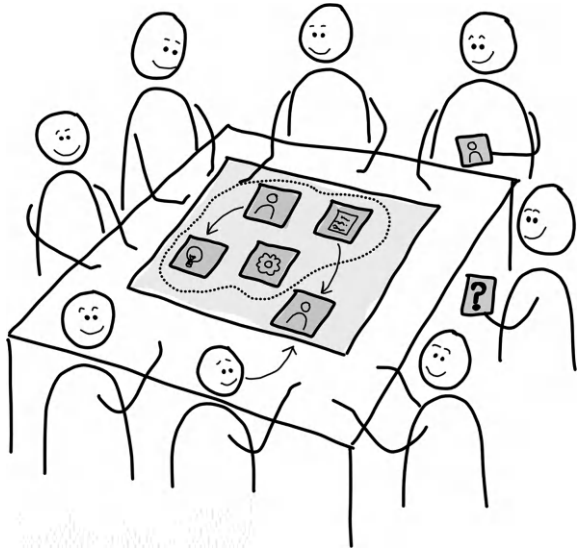
Boundary Critique enables participants to critically examine the assumptions and decisions that define the boundaries of a system. By exploring what is included or excluded and understanding the implications of these choices, participants gain deeper insights into the system's scope, stakeholder dynamics, and ethical considerations.

How It Works

Participants collaboratively define the system under analysis and visually represent its boundaries. Through facilitated discussions, they identify elements outside these boundaries that may still influence the system. This process encourages reflection on the rationale behind boundary decisions and their impact on understanding and decision-making.

Applications

This method is valuable in various contexts, including organizational development, policymaking, project management, and the analysis of complex social or environmental systems. It fosters critical thinking, inclusivity, and a comprehensive view of systemic interactions.



Exercise: "Boundary Critique"

Participants	Time	Equipment
5–15	1.5–2 hours	Large sheets of paper, markers, sticky notes

Space : A room with enough space for collaboration.

Setup

1. Prepare large sheets of paper and markers for participants to draw boundaries.
2. Arrange sticky notes for adding external factors.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain that system boundaries define what is included or excluded in the analysis.
   - Emphasize that boundaries influence understanding and actions.
2. **Define the system (10 minutes)**
   - As a group, identify the system or problem you'll be analysing.
   - Write a brief description of the system on a large sheet.
   - If unsure: see e.g., *Cluster Mapping* or *Causal Loop Diagrams*
3. **Draw initial boundaries (5 minutes)**
   - Have participants draw a boundary around the key elements they consider core to the system (stakeholders, processes, resources).
4. **Identify external factors (15 minutes)**
   - List elements outside the boundary that might still influence the system.
   - Place these factors on sticky notes outside the boundary.
5. **Discuss the boundary (20 minutes)**
   - Facilitate a discussion on the rationale behind including or excluding certain elements.
   - Explore how these decisions affect system understanding and stakeholder perspectives.
6. **Redraw boundary (10 minutes)**
   - Based on the discussion, redraw the system boundary if necessary.
   - Include or exclude elements based on the group's new insights.
7. **Debriefing (15 minutes)**
   - Reflect on the revised boundary and its implications.
   - Discuss how this new perspective might influence future decision-making and actions.

Tips for Facilitators

Encourage participants to challenge their initial assumptions about what is inside or outside the system. Facilitate open discussions, ensuring everyone contributes. Remind the group that boundaries are subjective and multiple perspectives are valid. Guide participants to think about how expanding or shrinking the boundaries might affect the system's dynamics. Ensure the discussion stays focused on balancing inclusivity while keeping the system manageable.

Tips for Debriefing

Create a reflective space for participants to share insights. Use questions like the following:

- What did you learn from changing the system boundary?
- How did the redrawn boundary affect your understanding of the system?
- What was challenging to include or exclude, and why?
- Who benefits from the current boundary, and who might be marginalized?
- How could a more inclusive boundary improve the system?

Summarize key takeaways, highlighting the importance of boundary decisions in shaping system analysis and outcomes.

Variations

- *Digital tools*: Use online whiteboards for remote teams, allowing real-time collaboration on system boundaries.
- *Quick version*: Focus on identifying the boundary without redrawing it for a faster analysis.
- *Layered boundaries*: Create multiple boundary layers to show different perspectives or priorities within the system.
- *Role-play*: Have participants take on different roles (e.g., customer, manager) and draw boundaries from those perspectives. This can reveal diverse stakeholder views on the system.

Note

Boundary Critique is the reflective process used to explore boundary judgments – decisions about what and who is included in or excluded from a system. It was developed by Werner Ulrich as a core part of Critical Systems Heuristics (CSH) [22]. In CSH, Ulrich introduced a set of boundary questions to surface hidden assumptions in system design and evaluation. These are outlined in the CSH method later in the book.

Appreciative Inquiry

Perspectives | Emergence | Leverage Points

Purpose

Appreciative Inquiry focuses on what gives life to a system when it is at its best. Instead of solving problems, it helps groups surface strengths, successes, and shared values to build a more positive future. This shift from "what's wrong" to "what works" enables deeper learning, trust, and alignment. It was developed by David Cooperrider and Suresh Srivastva [85] as a method for building positive change through dialogue, shared values, and a focus on what already works.

How It Works

Appreciative Inquiry uses a structured, dialogue-based approach to explore positive experiences, identify shared themes, and co-design future possibilities. Participants move through five key phases – Define, Discover, Dream, Design, and Destiny – combining storytelling, reflection, and planning to create actionable ideas grounded in what already works.

Applications

This method is often used in organizational development, community building, team reflection, and change work. It supports learning, motivation, and collaborative planning by shifting focus from gaps to assets.

Exercise: "Appreciative Inquiry"

Participants	**Time**	**Equipment**
6–20	60–90 minutes	Large paper, markers, sticky notes

Space **:** A room with enough space for groups to work for shared writing.

Setup

1. Prepare large sheets of paper or flip charts for capturing key points and ideas.
2. Arrange markers and sticky notes for group use.
3. Use sticky notes to capture quotes, actions, or values, then post them on the group map or poster during Dream and Design.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the focus is on what works well in the system.
   - Clarify it's about learning from strengths, not fixing problems.
2. **Define (10 minutes)**
   - Agree on a positive topic to explore (e.g., team strengths, successful collaboration, best outcomes).
   - Ensure everyone understands and supports the scope.
3. **Discover (20 minutes)**
   - In pairs, participants interview each other about their best experience related to the topic.
   - Write key quotes, values, or moments on sticky notes.
   - Post them on a shared surface (map or poster) to spot common themes.
4. **Dream (20 minutes)**
   - Imagine a system living up to those strengths every day.
   - Create a visual or phrase in small groups.
   - Add sticky notes for hopes, behaviours, or key ideas.
5. **Design (20 minutes)**
   - Identify what would support the dream.
   - Use sticky notes to list actions or shifts, then group them on the map or poster.
6. **Destiny (15 minutes)**
   - Identify next steps/commitments: What will you try? What can be done now?
   - Capture simple actions and assign responsibility if useful.
7. **Debriefing (15 minutes)**
   - Invite reflections on what was learned from sharing and listening.
   - Discuss how a strengths-based approach could influence their daily work.

Tips for Facilitators

Encourage participants to share openly and focus on moments of strength, not problems. Create a warm, conversational tone that supports storytelling. Use open-ended prompts to help participants recall specific, positive examples. During the Dream and Design phases, guide the group toward ideas that are practical yet inspiring.

Tips for Debriefing

Create a reflective and encouraging space for participants to consider how the exercise shifted their thinking. Ask questions such as the following:

- What did you notice when focusing on strengths instead of problems?
- Were there common themes in the stories shared?
- What values or principles stood out?
- How did imagining a positive future affect your mindset?
- What new ideas or possibilities emerged from this process?

Summarize the insights shared, highlighting key strengths and visions for the future. Encourage participants to consider how these can be carried into their work, decisions, or team practices.

Variations

Appreciative Inquiry can be adapted for different formats and time frames:

- *Quick inquiry:* Use only the Discover and Dream phases for shorter workshops.
- *Paired sharing:* Begin with 1:1 conversations before moving into group reflection.
- *Visual dreaming:* Have participants sketch or build a metaphor to represent their ideal future.
- *Remote version:* Run AI using breakout rooms, shared documents, and digital whiteboards.
- *Rolling inquiry:* Repeat Discover-Dream cycles regularly to surface new strengths over *time.*

World Café

Perspectives | Emergence | Interconnectedness

Purpose

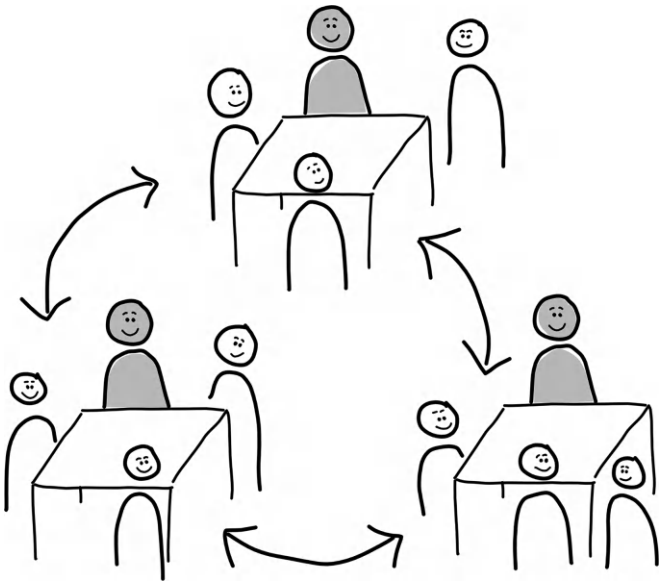
World Café creates a space for inclusive group dialogue by connecting diverse perspectives in a structured yet informal setting. Through rotating small-group discussions, participants surface shared understanding, identify key themes, and generate insights that might not emerge in conventional formats. The World Café method was developed by Juanita Brown and David Isaacs in the mid-1990s [92].

How It Works

Participants sit at small tables and discuss open-ended questions in timed rounds. After each round, they rotate to new tables, carrying ideas with them. A final plenary brings together the insights from all conversations, allowing the group to reflect on key patterns and implications.

Applications

This method is well-suited for strategic planning, team development, organizational change, education, and community engagement. It promotes collective intelligence, helps uncover hidden assumptions, and supports dialogue around complex or sensitive issues.



Exercise: "World Café"

Participants	Time	Equipment
12–200+	60–90 minutes	Small tables (4–5 people per table), markers, and large sheets of paper for notes, utensils to create a relaxed café-like atmosphere

Space : A large room with space for multiple tables and participant movement.

Setup

1. Arrange tables with paper and markers for each group, ensuring enough space for participants to move around between rounds.
2. Create a welcoming environment, encouraging informal conversation.

Instructional Steps

1. **Introduction (5 minutes)**
   - Welcome participants and introduce the purpose and process of World Café.
   - Explain that the goal is to foster deep conversations on various topics in a relaxed and open setting.
2. **Small-group rounds (20–30 minutes)**
   - Begin the first round of conversations, each table discussing a specific question.
   - Encourage participants to write key ideas and insights directly on the table's paper.
3. **Rotate participants (5 minutes)**
   - After each round, participants rotate to a new table.
   - Optionally, leave one participant behind as the "table host" to summarize previous discussions for newcomers.
4. **Continue conversations (20–30 minutes)**
   - Repeat the process for multiple rounds.
   - Encourage participants to build on the discussions from their previous tables and add new perspectives.
5. **Harvest insights (20 minutes)**
   - After the final round, gather participants for a plenary session.
   - Invite table hosts or participants to share key themes and insights from their discussions.
   - Capture the insights visually on a flip chart or whiteboard.
6. **Debriefing (15 minutes)**
   - Reflect on how the insights gathered can inform future actions or decisions.
   - Encourage participants to identify actionable next steps or areas for further exploration based on what they learned.

Tips for Facilitators

Create open-ended, engaging questions that promote exploration and dialogue. Ensure a comfortable and welcoming environment to encourage informal conversations. During the harvest phase, help participants focus on key takeaways and actionable insights.

Tips for Debriefing

Create a calm, reflective space where participants can absorb and interpret the conversations they've heard. Use guiding questions like the following:

- What were the most surprising insights from the conversations?
- How did rotating between tables shape the discussions?
- What patterns or themes emerged across different groups?
- How can the insights from these discussions inform future actions?

Encourage participants to consider how these discussions can lead to real-world applications and next steps.

Variations

- *Multiple topics:* Assign different guiding questions to each table to explore a broader range of issues. This allows for more diverse input and richer insight during the harvest.
- *Role-based rounds:* Have participants rotate through tables while playing specific stakeholder roles (e.g., client, policymaker, community member). This reveals how perspectives shift depending on one's position in the system.
- *Café host summaries:* Ask table hosts to visually capture ideas on graphic templates or posters, which can later be displayed for a gallery walk.
- *Digital world café:* Use virtual breakout rooms and shared digital whiteboards (e.g., Miro, Jamboard) to replicate the café experience online. Assign facilitators or timekeepers to keep rounds moving smoothly.
- *Silent café round:* Introduce a written-only round where participants respond to each other in writing on the table paper. This slows the pace and allows quieter participants to contribute more fully.
- *Youth or community edition:* Use more visual formats, metaphors, or storytelling prompts to make the experience accessible to broader or younger audiences.

Map

Understanding the System

Before we act in a system, we need to see it clearly and that means more than drawing a diagram. Understanding a system means recognizing how its parts fit together, how patterns repeat, where power flows, and what's driving behaviour below the surface.

Mapping helps shift our focus from reacting to symptoms to exploring causes. It creates space to slow down, ask better questions, and make smarter decisions. When we map, we begin to notice not just events and people but also the deeper patterns, structures, and assumptions that shape what happens again and again. With systems thinking, we move from surface-level focus to structural and mental model levels.

There are several levels at play in any system:

- *Events:* What just happened? What's visible?
- *Patterns:* What keeps happening? Are there cycles or trends?
- *Structures:* What's causing those patterns? What rules, roles, or routines hold them in place?
- *Mental Models:* What beliefs or assumptions shape how the system operates?

Mapping can support a shift in interventions toward where real leverage exists. Acting at the structural or mental model level often leads to deeper, longer-lasting change.

But mapping also requires care. Systems can be overwhelming if we try to see everything at once. A key part of the work is setting boundaries from our perspective: What's inside the system, and what's outside? What do we focus on now, and what do we set aside? Scope matters; it's not about capturing everything but about seeing enough to act with insight.

This chapter introduces a set of visual and physical methods for making systems visible – alone and together as a group. These tools are not about finding one correct map. They are about building shared understanding, revealing different perspectives, and noticing where people's views align or differ. Some tools

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focus on behaviour over time; others on relationships, feedback loops, or flows of money, energy, or people.

All these methods serve one purpose: helping people see more of the system they are part of – not just the part they deal with day to day. That shift from part to whole is what makes structural, strategic change possible.

Mapping is not the end goal. It's a way to think better together, test assumptions, and avoid acting on faulty mental models. When system understanding is shallow or incomplete, efforts often miss the mark or create new problems. A clearer view of how things work in a certain way – and why – gives us a better chance of making interventions with impact.

Air Circles

Perspectives | Boundaries | Interconnectedness

Purpose

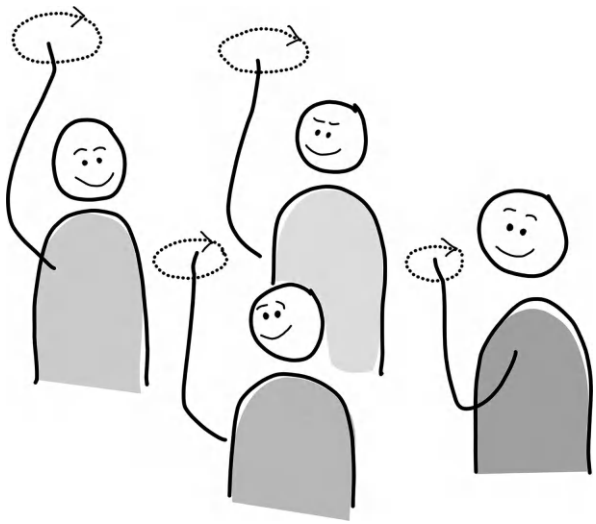
This exercise supports participants explore how perspectives shape interpretation. By drawing circles in the air and observing them from different viewpoints, participants experience how the same action can appear completely different depending on their position. This highlights the role of perception in understanding systems and decision-making.

How It Works

Participants use their index fingers to draw circles in the air above their heads. They then change their viewpoint – observing the movement from below, above, or the side. Depending on the perspective, the same motion may seem to change direction, reinforcing the idea that perception influences understanding.

Applications

This exercise is ideal for illustrating how different viewpoints lead to different conclusions. It supports systems thinking by emphasizing the importance of multiple perspectives in problem-solving, communication, and decision-making. It applies to leadership, conflict resolution, and complex system analysis by demonstrating that what seems "true" from one angle may look entirely different from another.



Exercise: "Air Circles"

Participants	Time	Equipment
2–20	10–15 minutes	None

Space : An open room with space for participants move around comfortably.

Setup

1. Have participants stand comfortably with enough space to move their arms freely.
2. Ask them to extend one arm and point their index finger upward.

Instructional Steps

1. **Introduction (2 minute)**
   - Guide participants through the exercise without explaining what will happen.
   - Let them experience the shift in perception on their own.
2. **Drawing a circle (1 minute)**
   - Instruct participants to move their index finger clockwise in a circular motion in the air above their heads.
   - Ask them to focus on the direction they see their finger moving.
3. **Changing Perspective (1 minute)**
   - Have participants lower their hands while continuing the circular motion.
   - Ask them to observe the movement from below.
   - Allow participants to experiment with other angles, such as viewing from the side.
4. **Debriefing (10 minutes)**
   - Ask participants how their perception of the motion changed.
   - Discuss how this relates to different perspectives in problem-solving.

Tips for Facilitators

Encourage participants to stay open to different viewpoints and notice how perception shifts with perspective. Avoid explaining the effect beforehand; let them experience it first. During the debrief, guide the discussion toward the role of perspective in decision-making and system understanding.

Tips for Debriefing

Create a reflective space where participants can explore their observations. Use these questions to guide the discussion:

- What did you notice when you changed your perspective?
- How did your understanding of the motion shift?
- What assumptions did you make before changing viewpoints?
- How does this relate to how people see problems differently?
- Can you think of a real-world situation where perspective changes interpretation?
- How can this exercise inform decision-making and collaboration?

After gathering responses, summarize key takeaways, focusing on perspective shifts, assumptions, and the value of multiple viewpoints in understanding systems.

Variations

- *Partner observation:* One participant performs the motion while another observes and describes what they see.
- *Perspective walk:* Participants move around and view different people's movements from multiple angles.
- *Mirror challenge:* Participants draw circles with both hands in opposite directions, testing cognitive flexibility.
- *Unseen influence:* Introduce a new movement without announcing it and let participants discover the change.
- *Role-based reflection:* Assign participants different roles (e.g., analyst, decision-maker), and ask how perspective impacts interpretation in their role.

Adaptive Pen Control

Interconnectedness | Feedback Loops | Delays | Emergence | Leverage Points

Purpose

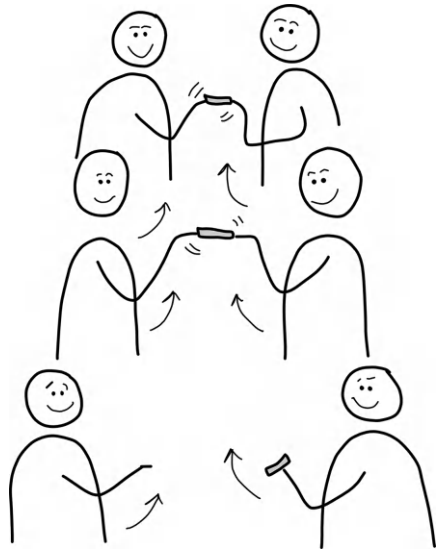
This exercise helps participants experience how systems respond to uncertainty, cooperation, and coordination. Two people balance a pen between their index fingers, directly experiencing interdependence and system dynamics. They can test pressure, movement, and balance to observe effects.

How It Works

Two participants stand facing each other and balance a pen *horizontally* between their extended index fingers. The pen *should stay in a horizontal position*, which makes the task more sensitive and harder to control than a vertical one. They are not allowed to grip the pen, only stabilize it through pressure and movement. Their interaction influences the pen's stability, simulating dependencies and reactions within a system.

Applications

This exercise helps show how systems react to uncertainty, interdependence, and coordination. It highlights balance, communication, and adaptability in maintaining stability. Participants experience how small changes disrupt or support a system, offering insights into teamwork, leadership, and group dynamics in business, project work, or organisational development.



Exercise: "Adaptive Pen Control"

Participants	**Time**	**Equipment**
2–20	15–30 minutes	One pen per team

Space **:** An open room with space for participants move around comfortably.

Setup

1. Participants form pairs and receive a pen.
2. Partners face each other and balance the pen only using their index fingers without gripping it.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the goal is to keep the pen balanced between both participants as they move.
   - Encourage them to observe what happens when they adjust pressure, movement, and coordination.
2. **Establish the Movement (5 minutes)**
   - Start with slow, controlled movements to get a feel for the balance.
   - Experiment with moving forward, backward, and rotating.
   - Notice how small changes in pressure or positioning affect stability.
3. **Increase Complexity (5 minutes)**
   - One participant closes their eyes while continuing to balance the pen.
   - Change directions suddenly or introduce unpredictable movements.
   - Attempt different physical challenges like squatting or stepping over obstacles.
4. **Debriefing (15 minutes)**
   - Ask participants how they adapted to their partner's movements.
   - Discuss how this exercise relates to teamwork and coordination in real life.

Tips for Facilitators

Encourage participants to stay aware of their movements while adjusting to their partner. Promote clear communication and adaptability, guiding the debrief toward teamwork and coordination in real-world settings.

Tips for Debriefing

Create a supportive space for reflection and encourage participants to connect the exercise with collaboration and adaptability. Use these questions to guide the discussion:

- How did you adjust to your partner's movements?
- What strategies helped maintain balance?
- How did non-verbal communication affect coordination?
- What challenges did you face as movements became more complex?
- How does this experience relate to teamwork in uncertain situations?
- What adjustments did you make to improve stability?
- How can these insights be applied to real-world collaboration?

After gathering responses, summarize key takeaways, focusing on coordination, adaptability, and shared awareness. Encourage participants to consider how these skills apply to their work or personal interactions.

Variations

Adaptive Pen Control can be adapted to different goals, group sizes, or contexts, with variations that enhance engagement and highlight coordination and adaptability.

- *Multiple pens:* Increase difficulty by having participants balance two or more pens at the same time (same hand or different hand), requiring greater focus and synchronization.
- *Silent balance:* Complete the exercise without speaking, emphasizing non-verbal communication and shared awareness.
- *Obstacle challenge:* Navigate around obstacles while keeping the pen stable, reinforcing teamwork and controlled movement.
- *Random instructions:* A facilitator introduces sudden movement changes, requiring quick adaptation and coordination.
- *Celebration move:* Every minute, participants perform a coordinated movement or gesture, reinforcing teamwork and a sense of accomplishment.

Group Juggle

Interconnectedness | Feedback Loops | Delays | Emergence | Leverage Points

Purpose

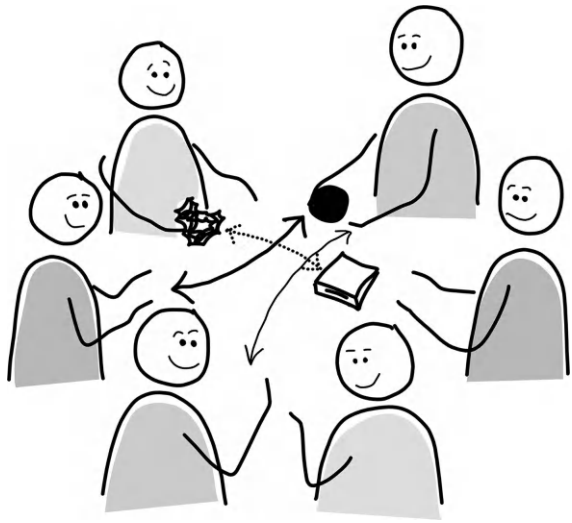
The goal of this exercise is to help participants experience how complexity increases in systems as new elements are introduced. By simulating the juggling of tasks or responsibilities within a system, participants will visually and physically experience how complexity grows and how communication and coordination become more critical in managing complexity.

How It Works

Participants form a circle and toss objects across the group in a fixed pattern. Each person must remember who they receive from and who they pass to. As more objects are added – following the same pattern – the group must coordinate multiple moving elements at once. This creates rising complexity and pressure on timing, attention, and communication, reflecting how interconnected systems behave under load.

Applications

This exercise is ideal for illustrating systems thinking concepts such as feedback loops, interdependencies, and complexity in fields like business, project management, and team dynamics. It helps participants understand the need for adaptability and effective communication in complex systems.



Exercise: "Group Juggle"

Participants	Time	Equipment
5–20	30–45 minutes	Various objects (balls, toys, small items)

Space : An open room with space for participants to stand in a circle and move around comfortably.

Setup

1. Arrange participants in a circle where they can easily toss objects to one another.
2. Prepare several objects of different types (e.g., balls, small toys) for passing.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the exercise shows how systems become more complex as more elements are added.
   - Mention that each object represents an element that must be managed in the system.
2. **Establish the pattern (5–10 minutes)**
   - Start with one object.
   - Toss it to someone across the circle, then they toss it to another.
   - Create a clear passing pattern that everyone follows.
3. **Increase complexity (10–15 minutes)**
   - Add a second object, following the same – or a different – pattern.
   - Keep adding more objects, one at a time, while keeping the pattern(s).
4. **Maintain order (5 minutes)**
   - Ensure participants follow the pattern(s), and keep track of who they receive from and who they pass to.
5. **Debriefing (15 minutes)**
   - Ask participants how the complexity increased as more objects were added.
   - Discuss strategies for handling multiple elements at once, and connect it to real-world situations.

Tips for Facilitators

Encourage participants to stay focused on their specific roles while juggling multiple objects. Promote clear communication and cooperation. During the debrief, guide the discussion toward real-world applications, such as how complexity is managed in business or team settings.

Tips for Debriefing

Create a positive space for reflection, and encourage participants to connect the exercise with real-world challenges of complexity and collaboration. Use these questions to guide the discussion:

- How did the complexity change as more objects were introduced?
- What strategies helped you manage the increasing number of objects?
- How did communication affect the group's ability to handle complexity?
- How does this experience relate to managing real-world systems or projects?
- What adjustments did you make to adapt to the complexity?
- How can you apply what you learned here to improve coordination in your work or team?

After gathering responses, summarize key points, focusing on the importance of coordination, adaptability, and communication in managing complex systems. Encourage participants to reflect on how these skills can be applied in their work or personal lives, identifying specific actions they can take.

Variations

Group Juggle can be adapted to fit different goals, group sizes, or contexts, with variations that boost engagement and highlight complexity and teamwork.

- *Name and adjective introduction*: Have participants introduce themselves with an adjective that starts with their name (e.g., "Lively Laura"). This adds fun and helps the group bond quickly.
- *Water passing challenge*: Replace objects with a glass of water to emphasize care and responsibility. This variation mirrors how precision is needed in real-world systems to avoid mistakes.
- *Smaller teams*: Divide participants into smaller groups. Each group manages their own sequence, then comes together to increase complexity. This emphasizes teamwork on a smaller scale before joining into a larger system.
- *Silent juggle*: Introduce a non-verbal challenge by completing the juggle in silence. This emphasizes non-verbal communication and coordination.

Triangles

Interconnectedness | Emergence | Delays | Nonlinearity | Leverage Points

Purpose

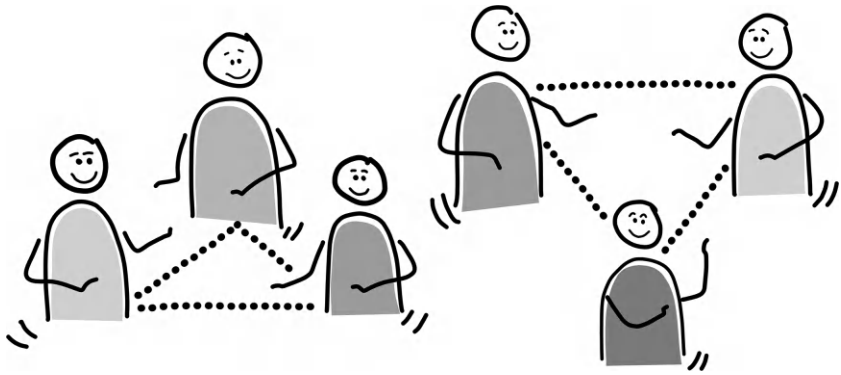
The goal of this activity is to demonstrate how individual actions within a system create interdependent patterns. By illustrating how each participant's movements affect others, this exercise shows how complex systems emerge from simple rules and interconnected behaviours.

How It Works

Each participant secretly chooses two others in the group. Their task is to move in a way that keeps them at equal distance from both chosen individuals – aiming to form an equilateral triangle. As everyone does this simultaneously, the group begins to move as a whole, and complex, interconnected patterns emerge.

Applications

This exercise is ideal for introducing systems thinking concepts like interdependence, emergent behaviour, and complexity. It is widely applicable to fields such as organizational behaviour, team-building, and social systems analysis. It demonstrates how systems self-regulate and adapt based on local decision rules.



Exercise: "Triangles"

Participants	Time	Equipment
6–50+	20–30 minutes	none

Space **:** An open area with enough room for participants to move around freely.

Setup

1. Ask participants to spread out randomly around the room.
2. Ensure there's enough space for participants to move without restriction.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the activity demonstrates how individual actions impact the entire group.
   - Participants will form triangles with two chosen individuals and work to maintain equal distance from them.
2. **Secret selection (3 minutes)**
   - Ask each participant to secretly choose two others in the group.
   - They must not reveal their choices to anyone.
3. **Triangle formation (5 minutes)**
   - Emphasize that the triangle is a moving target; everyone is adjusting in real time. The goal is not perfection but continuous balancing.
   - They should maintain equal distance from both of their selected people at all times.
4. **Movement phase (5 minutes)**
   - On your signal, participants begin moving to maintain their triangles.
   - Encourage slow, deliberate movements to allow everyone to adjust and balance.
5. **Observation**
   - As participants move, observe how the entire group is constantly adjusting, and note the emerging patterns of movement.
6. **Debriefing (15 minutes)**
   - Call a halt to the movement and facilitate a group discussion. Focus on how individual actions influenced the group and the emergence of complex patterns.

Tips for Facilitators

Encourage participants to move carefully and observe how their movements affect the whole group. It's common for the system not to settle – when several people choose the same target, it can create mathematically unsolvable setups, which offer rich ground for discussing system dynamics. In the debrief, highlight how individual actions ripple through the group, creating complex behaviour from simple rules.

Tips for Debriefing

Create a space for reflection and encourage participants to link the exercise to real-world interdependence and teamwork. Use these questions to guide the discussion:

- How did your movements impact the overall group behaviour?
- What patterns did you notice as everyone tried to maintain their triangles?
- How does this activity reflect the interdependence of systems in real-world situations?
- How does this exercise relate to interdependent roles in teams or organizations?
- What adjustments did you make as the system changed or became more complex?
- How can you apply these insights into your work, especially when managing dependencies in projects or teams?

After the discussion, summarise key points on how individual actions ripple through systems and lead to complex outcomes. Encourage participants to consider how this understanding can support better coordination, adaptability, and teamwork in their work or personal lives.

Variations

The Triangles exercise can be adapted to suit different contexts or dynamics:

- *Shared participants:* Deliberately assign some people to be chosen by multiple others to show how key connectors shape the system.
- *Distance challenge:* Ask participants to keep more distance from their chosen people, making balance harder and movement more deliberate.
- *Silent movement:* Run the exercise without speaking to emphasize observation and non-verbal coordination.
- *Role reversal:* Partway through, have participants pick new people, simulating shifts in roles or priorities.
- *Speed variation:* Gradually speed up or slow down movement to explore how systems react to different rates of change

Live Systems Mapping

Interconnectedness | Emergence | Boundaries | Perspectives | Delays

Purpose

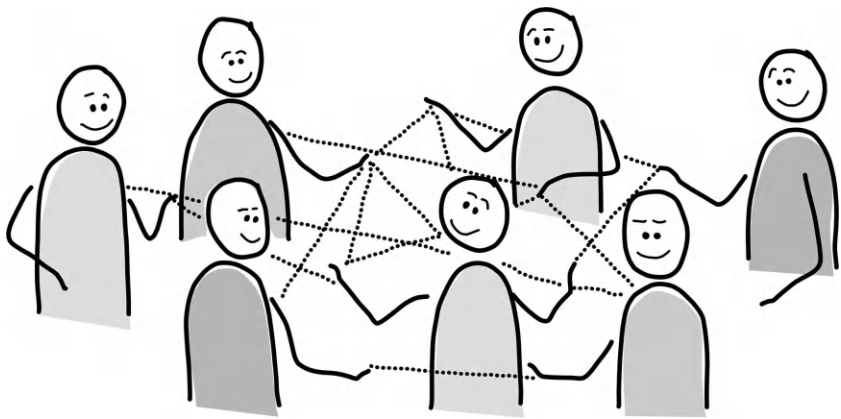
Live Systems Map transforms static system diagrams into a physical, interactive experience. Participants embody elements of a system, creating connections with ropes or objects to visualize relationships. As elements enter or exit, the group must adjust, demonstrating how systems evolve over time.

How It Works

Participants physically represent parts of a system and connect using ropes or objects to show relationships such as influence, dependency, or flow. When a participant "enters" or "exits," the network must shift, illustrating real-time structural changes.

Applications

This method is useful in project management, systems thinking, leadership training, and organizational change workshops. It helps teams understand interdependencies, adaptation, and resilience within complex systems.



Exercise: "Live Systems Mapping"

Participants	**Time**	**Equipment**
8–25	20–40 minutes	Long ropes, strings, or objects to represent connections

Space : A large room or open space where participants can move freely.

Setup

1. Provide ropes, strings, or objects for participants to use as connections.
2. Assign each participant a role (e.g., stakeholder, department, process, resource).
3. Define an initial structure where participants connect based on relationships within the system.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose: to experience system interdependencies in a dynamic, embodied way.
   - Share real-world examples of evolving systems (teams, ecosystems, supply chains).
2. **Building the System (10 minutes)**
   - Each participant establishes a connection with two or more others using ropes or objects.
   - Ensure every connection represents a meaningful relationship (e.g., influence, dependency, resource flow).
   - Observe the initial system structure.
3. **Dynamic change (10 minutes)**
   - Introduce changes:
     i. A participant "leaves" (steps out of the system).
     ii. A new element "enters."
     iii. A connection weakens or strengthens.
   - Each time a change occurs, participants must adjust their positions to maintain stability.
   - Observe how the structure adapts. Once the group synchronizes, allow them to continue briefly, then stop the activity and discuss their experience.
4. **Debriefing (15 minutes)**
   - After several changes, pause and discuss how the system evolved.
   - Explore together how participants felt when connections changed and what patterns emerged.

Tips for Facilitators

Encourage participants to think critically about their roles and connections. Use guiding questions to help them assess how changes affect stability. Observe when the system reaches equilibrium and when it struggles to adapt, drawing parallels to real-world organizational and social systems.

Tips for Debriefing

Facilitate an open discussion using guiding questions such as the following:

- How did the system change when elements were added or removed?
- What types of connections were the most stable or fragile?
- How does this relate to real-world systems you are part of?
- What insights can you apply to managing change in teams or organizations?

Summarize key learnings and encourage participants to reflect on adaptability, resilience, and system-wide impact.

Variations

Live Systems Map can be adapted for different settings and learning goals:

- *Role changes*: Assign different system elements partway through the exercise to shift perspectives.
- *Weighted connections*: Use different rope lengths or thicknesses to represent strong or weak relationships.
- *External disruptions*: Introduce external forces (e.g., market shifts, leadership changes) to see how the system reacts.
- *Remote adaptation*: Use a virtual whiteboard where participants draw connections and adjust in real time.

Note

This activity draws on physical systems mapping methods known as "3D Mapping" based on the work of Otto Scharmer, where participants use space to explore interdependence and change in real time [84].

Bathtub Game

Stocks and Flows | Delays | Feedback Loops | Leverage Points | Interconnectedness

Purpose

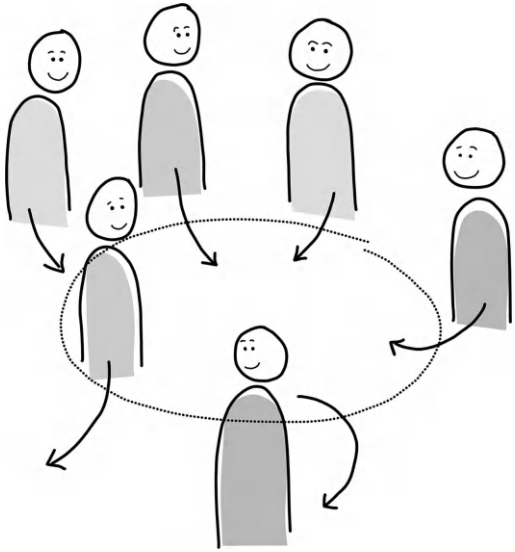
This exercise helps participants experience how inflows, outflows, and accumulation work in systems. By using a marked area (the "bathtub") instead of water, participants physically represent system changes, highlighting the role of delays and balancing mechanisms.

How It Works

A designated space on the ground serves as the bathtub, where a limited number of participants can stand. Each new participant entering the space represents an inflow, while each person leaving represents an outflow. Through movement and observation, participants will experience how imbalances and delays affect system stability.

Applications

This exercise is ideal for illustrating key systems thinking concepts, such as accumulation, feedback loops, and delays. It applies to topics in project management, resource allocation, organizational dynamics, and economics by demonstrating how systems react to change over time.



Exercise: "Bathtub Game"

Participants	Time	Equipment
6–20	20–30 minutes	Marked area on the ground (the "bathtub"), optional cue cards for inflow/outflow rules

Space : Open area large enough to accommodate movement and the designated bathtub circle/marked area.

Setup

1. Mark a circle on the ground, large enough for a few participants to stand inside.
2. Explain that the bathtub represents a system managing people as a resource.
3. Define inflow and outflow rules (e.g. entry requires someone to leave).

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the marked area represents a system where people entering and leaving symbolize inflows and outflows.
   - Highlight that the goal is to observe how the system responds to different changes over time.
2. **Steady state (5 minutes)**
   - Start with a balanced system where inflow equals outflow.
   - Observe how stability is maintained when one person enters and another person leaves at the same time.
3. **Exploring accumulation (5 minutes)**
   - Increase the inflow rate by having more people enter the bathtub without immediate outflows.
   - Let participants observe overcrowding when inflow exceeds outflow.
4. **Demonstrating delays (5 minutes)**
   - Stop the inflow, but let some people leave the bathtub.
   - Highlight the delay as participants adjust to restore balance.
5. **Challenge participants (5 minutes)**
   - Set a target number of people inside the bathtub, and ask the group to manage inflows and outflows to maintain balance.
   - Introduce disturbances, such as sudden inflow surges or unpredictable outflow rules, simulating real-world system changes.
6. **Debriefing (15 minutes)**
   - Ask how they balanced inflow and outflow.
   - Discuss how delays impacted the system's ability to adjust to changes.

Tips for Facilitators

Encourage participants to think about how the number of people in the bathtub represents accumulation over time. Highlight the role of delays in system adjustments. Use real-world examples such as workforce management, traffic flow, or resource allocation to help participants connect the exercise to practical scenarios.

Tips for Debriefing

Create a reflective space focused on learning. Ask participants to consider how movement in and out of the bathtub affected stability. Use questions such as the following:

- How did changes in inflows and outflows impact the number of people in the bathtub?
- What role did delays play in adjusting to the system's changes?
- How does this relate to real-world systems, like team capacity or financial planning?
- What strategies helped maintain a steady number of people?
- How do feedback loops influence decision-making in systems with inflows and outflows?
- What factors made it harder to maintain stability?

Summarize key points, emphasizing the importance of understanding inflows, outflows, delays, and feedback loops. Encourage participants to apply these insights to real-world challenges, such as project timelines, supply chain management, or policymaking.

Variations

The Bathtub Game can be adapted for different group sizes and objectives:

- *Multiple Bathtubs:* Use different marked areas to simulate interconnected systems and their dependencies.
- *Limited Entry:* Restrict the number of people allowed in at a time, mimicking constraints like workforce limits or budget caps.
- *Sudden Shocks:* Introduce unexpected inflow or outflow changes to represent economic shifts or crisis scenarios.
- *Role-Based Challenge:* Assign different roles (e.g., decision-makers, regulators) to explore how policies affect system balance.

Note

This activity draws on the classic "bathtub" metaphor in systems dynamics [33, 59], using movement to reveal accumulation, delays, and feedback.

DSRP Framework

Interconnectedness | Boundaries | Perspectives | Emergence

Purpose

The DSRP Framework, developed by Derek and Laura Cabrera [53], is a theory of structural cognition based on the idea that complex thinking involves four underlying patterns: Distinctions, Systems, Relationships, and Perspectives. Rather than being a step-by-step method, it models how people naturally organize information, reason about systems, and build mental models.

How It Works

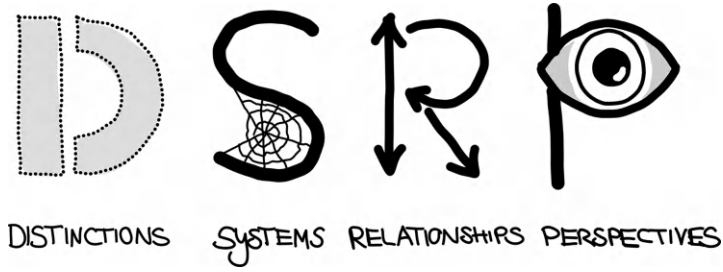
DSRP posits that human cognition involves four universal patterns:

- *Distinctions (D)*: Identifying what something is and what it is not.
- *Systems (S)*: Recognizing parts and wholes within a system.
- *Relationships (R)*: Understanding how elements are connected and interact.
- *Perspectives (P)*: Considering different viewpoints and contexts.

These patterns are not sequential steps but occur simultaneously, enabling individuals and teams to structure information and ideas more effectively.

Applications

DSRP is applicable in education, organizational development, policy analysis, and personal decision-making. It serves as a tool for enhancing critical thinking, fostering creativity, and improving problem-solving by encouraging a structured yet flexible approach to understanding complex systems.



Exercise: "DSRP Framework"

Participants	**Time**	**Equipment**
1–10	30–60 minutes	Paper, markers, sticky notes, or digital mapping tools

Space **:** A room conducive to individual reflection and group discussion.

Setup

1. Give each participant enough space to work individually – paper, pens, sticky notes, or a tablet.
2. Write the four DSRP headings clearly on a flip chart or board: Distinctions, Systems, Relationships, Perspectives.
3. Explain each one briefly with a simple example before starting the exercise.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that DSRP is a simple structure for thinking more clearly about complex situations.
   - Emphasize that it supports deeper insight, not just surface-level analysis.
2. **Identifying complex issue (10–15 minutes)**
   - Participants choose a real-world problem or issue they're currently facing.
   - It can be personal, organizational, or societal – whatever feels most relevant.
3. **Apply DSRP pattern (20–30 minutes)**
   - **Distinctions:** What is this issue? What is it not? What's inside or outside its boundary?
   - **Systems:** Break the issue into parts. What whole(s) does it belong to?
   - **Relationships:** What causes what? How are elements linked or dependent?
   - **Perspectives:** Who sees this differently? What changes from another point of view?
4. **Group sharing (10–15 minutes)**
   - Ask for volunteers to share highlights from one or more sections.
   - Compare how differently people approached the same topic using the DSRP lens.
5. **Debriefing (15 minutes)**
   - Ask participants to reflect on their personal learning from applying the DSRP patterns.
   - Encourage them to consider how using distinctions, systems, relationships, and perspectives changed the way they understood the issue.

Tips for Facilitators

Start by clearly explaining each DSRP element with simple examples. Encourage participants to move slowly through the steps, especially when unpacking relationships and perspectives. Allow for quiet reflection before group sharing to help surface deeper insights. Use the whiteboard or sticky notes to make thinking visible and rearrange elements as connections emerge. Reinforce that the goal is clarity, not complexity. Highlight how DSRP is a thinking habit, not just a one-time tool.

Tips for Debriefing

Invite participants to reflect on how each DSRP element shifted their understanding. Use prompts such as the following:

- Which part of DSRP was most difficult or surprising?
- Did seeing the relationships between parts change how you view the issue?
- How did considering different perspectives expand your view?
- What assumptions did you uncover?

Encourage participants to link insights back to real decisions or projects. Ask how they might use DSRP thinking beyond the session – in team work, planning, or communication.

Variations

DSRP can be tailored to fit different formats or goals:

- *DSRP journaling*: Individuals use the four patterns for daily reflection or sense-making.
- *Role-switching*: Assign participants different stakeholder perspectives to practice perspective-taking.
- *Check-in tool*: Use DSRP as a recurring exercise during projects to revisit assumptions and adjust thinking.
- *Digital version*: Use collaborative whiteboard tools to structure and share thinking.

Behaviour Over Time Graphs

Feedback Loops | Delays | Stocks and Flows | Nonlinearity | Perspectives

Purpose

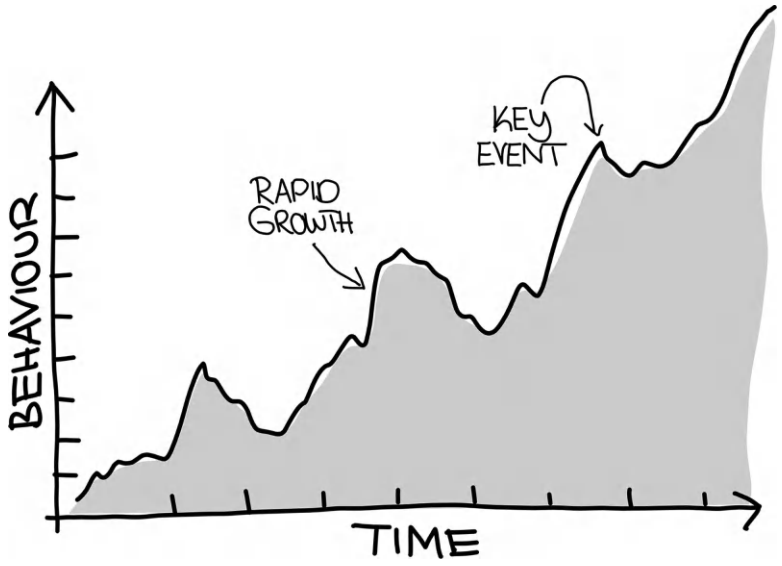
The goal of this exercise is to help participants identify and analyse trends in systems by visualizing how key variables change over time. This helps reveal patterns, relationships, and potential future scenarios that can aid in understanding system dynamics and making informed decisions.

How It Works

Participants select key variables relevant to a system or problem and plot their behaviour over time on a graph. They analyse past trends, predict future changes, and discuss the relationships between variables.

Applications

This activity is perfect for strategic planning, systems analysis, and problem-solving across fields like business, environmental studies, social sciences, and project management. It encourages participants to think about long-term trends rather than focusing only on immediate effects.



Exercise: "Behaviour Over Time Graphs"

Participants	Time	Equipment
3–5	30–25 minutes	Large sheets of paper or flip charts, markers in various colours, ruler (optional)

Space: A room with tables and enough space for participants to work individually or in small groups.

Setup

1. Provide each participant or group with paper and markers.
2. Ensure everyone has enough space to create and display their graphs.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that Behaviour Over Time Graphs (BOTGs) help visualize how variables in a system change over time, highlighting patterns and trends.
   - Show an example of a simple BOTG to clarify the concept.
2. **Identify key variables (5 minutes)**
   - Ask participants to brainstorm key variables relevant to the system or problem being analysed (e.g., population, stress, revenue).
   - Encourage them to consider both tangible and intangible variables.
3. **Create the graphs (10–15 minutes)**
   - For each variable, draw a horizontal axis (time) and a vertical axis (value).
   - Have participants plot how the variable has changed in the past and project possible future trends.
4. **Annotate the graphs (5 minutes)**
   - Ask participants to add notes about key events that caused changes, potential reasons for trends, and points where the trend shifted direction.
5. **Identify relationships (5 minutes)**
   - Compare different variables' graphs to explore potential relationships.
   - Discuss how changes in one variable might influence others.
6. **Debriefing (15 minutes)**
   - Ask participants to individually reflect on their personal learning from the exercise.
   - Encourage them to think about how creating BOTGs influenced their understanding of the problem and different perspectives.

Tips for Facilitators

Encourage participants to think about how visualizing trends over time helps them see the bigger picture. Help them connect the activity to real-world scenarios where understanding past trends can guide future actions. During the debrief, guide participants toward actionable insights.

Tips for Debriefing

Create a positive space for reflection. Ask participants to consider the insights they gained from the graphs. Use these questions to guide the discussion:

- What key variables did you plot, and how did they behave over time?
- Were there any surprising trends or patterns?
- How do these variables interact with one another in the system?
- What events caused changes or shifts in the trends?
- How can understanding these trends help in decision-making or problem-solving?
- What changes could be made to affect future trends in a positive way?

Summarize the key points by focusing on the importance of visualizing long-term trends and identifying relationships between variables. Encourage participants to apply these insights to their work or personal decision-making processes.

Variations

Behaviour Over Time Graphs can be adapted to fit different contexts, group sizes, or objectives:

- *Multiple scenarios*: Ask participants to plot several different future scenarios (e.g., best case, worst case) to show how different decisions or events might impact the system.
- *Group collaboration*: Have groups create BOTGs together, combining their perspectives to create a richer analysis of the system.
- *Digital tools*: Use graphing software or apps to create digital BOTGs, allowing for easier sharing and updating during the analysis.
- *Timeframe focus*: Focus on different timeframes (e.g., short-term vs. long-term) to show how trends can vary depending on the scope of analysis.

Paper Computer

Feedback Loops | Nonlinearity | Perspectives | Boundaries | Leverage Points

Purpose

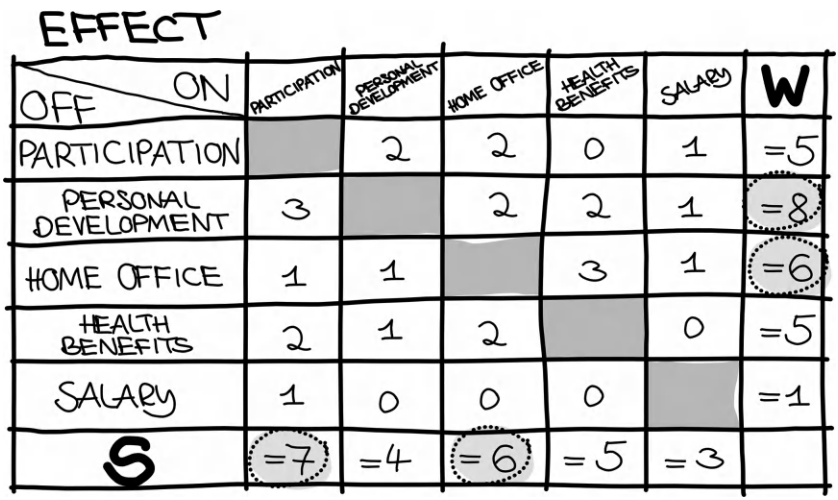
The Paper Computer, developed by Frederic Vester [93], is a participatory tool for mapping and analysing systemic relationships. It helps participants identify key drivers, dependencies, and leverage points (effect on, effect off) in complex situations by building and interpreting an influence matrix. The goal is not numerical accuracy but shared insight – to surface assumptions, recognize patterns, and guide strategic focus.

How It Works

Participants select system elements and assess how strongly each one influences the others. These influence scores are entered into a matrix. Once complete, the matrix is used to calculate each element's activity (how much it affects others) and passivity (how much it is affected). From these values, elements can be interpreted as levers, buffers, indicators, or destabilizers – depending on how much they influence or are influenced

Applications

Useful in strategic planning, systems analysis, environmental policy, organizational change, or education. It supports structured dialogue and helps visualize hidden interdependencies. The method works well in interdisciplinary groups or where stakeholders hold very different views of a system.



Exercise: "Paper Computer"

Participants	Time	Equipment
4–20	60–90 minutes	Large paper, pens/markers, calculator, or spreadsheet

Space: Tables or wall space for collaborative scoring and discussion.

Setup

1. Choose a specific issue or challenge within a system.
2. Collect input: brainstorm 6–12 key elements that influence or are influenced by this issue (e.g., trust, participation, salary, leadership).
3. Draw a matrix with the same elements on both axes (leave diagonals blank).
4. Provide pens or dots and space to total each row and column.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the Paper Computer maps influence within a system.
   - Emphasize that the goal is to understand structure, not achieve precision.
2. **Score the matrix (20 minutes)**
   - For each cell, ask: "What is the effect of this element (row) on one (column)?"
   - Use 0 = no influence, 1 = weak, 2 = moderate, 3 = strong.
   - Facilitate consensus or voting to agree on scores.
3. **Calculate activity and passivity (10 minutes)**
   - For each element:
     i. Activity (W): sum of the row – how much this element influences others
     ii. Passivity (S): sum of the column – how much this element is influenced
4. **Interpret the results (15 minutes)**
   - Use results to identify where action, protection, or further learning is needed:
     i. High W: active – possible leverage point
     ii. High S: passive – sensitive or reactive element
     iii. High W and S: critical system node
     iv. Low W and high S: good monitoring indicator, not a starting point for change
5. **Debriefing (15 minutes)**
   - Highlight elements that seemed passive but were central or active ones that lacked attention.
   - Discuss how this reshaped their view of the system and where change might be most effective.

Tips for Facilitators

Let the group do the scoring; it's the discussion that matters. Don't rush the matrix: people often surface hidden assumptions midway. Watch for dominant voices; ensure each person's perspective is heard. Use visual cues to flag high-activity or high-passivity elements early. Consider using a spreadsheet to speed up calculations.

Tips for Debriefing

Help the group reflect not just on the scores but also on what those numbers reveal. Ask participants how their understanding of the system shifted during the exercise. Did any relationships surprise them? Were there elements they hadn't thought of as powerful but turned out to be highly influential or vulnerable?

Use questions like the following:

- Which elements were more influential than expected?
- What surprised you about the way elements interact?
- Did the matrix surface assumptions or blind spots?
- Where do you see leverage or risk based on the results?
- How would this affect where and how you intervene?

Encourage teams to connect the analysis to real decisions they face. Ask them to define one action or strategy that could benefit from this insight. Emphasize that the value isn't just in the matrix; it's in how it helps the group think more structurally about their system.

Variations

The Paper Computer can be adapted for different settings and group needs:

- *Predefined elements:* Provide a preselected list of system elements to save time or focus on a specific issue.
- *Digital matrix:* Use spreadsheet tools or online templates to speed up scoring and calculations, especially in remote sessions.
- *Silent scoring:* Have participants score individually first, then compare to surface differences in perception before group discussion.
- *Scenario comparison:* Build two matrices for different future scenarios to explore how influence patterns shift.
- *Stakeholder lens:* Let different groups (e.g., funders, users, policymakers) score the same system separately and compare their results.

Note

The Paper Computer is the core tool in Vester's Sensitivity Model [93]. It combines structured scoring with group reflection. While originally done on paper, many facilitators now use spreadsheets or online tools to streamline scoring and calculations.

Refrigeration Game

Feedback Loops | Delays | Stocks and Flows | Nonlinearity | Perspectives | Boundaries

Purpose

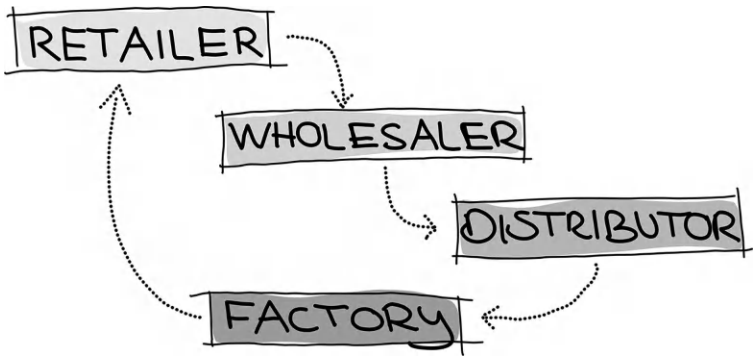
This simulation, originally developed by Jay W. Forrester in the 1950s [59], helps participants experience how delays, stock-flow structures, and feedback mechanisms work in a simple supply chain. It shows how decentralized decision-making and limited information can lead to instability, even in systems with constant demand.

How It Works

Participants take on roles in a supply chain – typically retailer, wholesaler, distributor, and factory. Over a series of rounds, each role places orders and manages inventory based on local information. Despite constant customer demand, the system often becomes unstable, revealing how delays and poor feedback create the "bullwhip effect."

Applications

The Refrigeration Game is widely used in education and organizational settings to demonstrate systemic causes of instability. It applies to logistics, operations, team coordination, project management, and policy. It's especially valuable for highlighting how well-intentioned decisions can cause unintended effects over time.



Exercise: "Refrigeration Game"

Participants	Time	Equipment
4–25	40–60 minutes	Role sheets, tracking forms, pens, optional whiteboard

Space: Room with space for small teams (four people per team, one per role in the supply chain).

Setup

1. Divide into teams of four roles: Retailer, Wholesaler, Distributor, Factory.
2. Each player gets an order form and tracking sheet.
3. Use chips/tokens to represent product units (e.g., refrigerators).
4. Set demand at a constant (e.g., 4 units per round). Start with a small inventory.
5. Deliveries have a two-round delay. Orders move one step per round.

Instructional Steps

1. **Introduction (2 minutes)**
   - Introduce the supply chain structure and the goal: meet demand while keeping inventory and backlog low.
   - Explain that players can only communicate through order slips – no verbal coordination.
2. **Game Play (30–45 minutes; 10–12 rounds)**
   - Each round, players:
     i. Receive inventory shipments.
     ii. Fulfil orders from downstream partners.
     iii. Record inventory, backlog, and received goods.
     iv. Place a new order upstream.
   - Players will experience swings in inventory and backlogs despite steady demand. Each participant establishes a connection with two or more others using ropes or objects.
3. **Debriefing (15 minutes)**
   - Review patterns that emerged – especially the "bullwhip effect."
   - Plot inventory and orders over time if tracked.
   - Discuss what players assumed and how limited visibility shaped their decisions.

Tips for Facilitators

Encourage participants to focus on their own role, and avoid coordination outside the defined structure. Let the system play out without interference; this is key for revealing patterns like overreaction and delay. Track inventory and order swings for debriefing. Highlight how the system behaves despite steady demand.

Tips for Debriefing

Facilitate an open discussion using guiding questions such as the following:

- What caused inventory and backlogs to rise or fall?
- How did delays and limited information affect your decisions?
- Were your actions based on current data or assumptions?
- How does this connect to real-world systems you've experienced?

Summarize key learnings and explore how system structure – not individual error – often drives instability. Reflect on how feedback, timing, and visibility shape performance.

Variations

The Refrigeration Game can be adapted for different settings and learning goals:

- *Product Swap:* Change "refrigerator" to reflect your audience (e.g., vaccines, food, laptops).
- *Role Shift:* Let participants switch roles mid-game to see the system from a new angle.
- *Policy Constraint:* Add limits or rules to simulate regulation or crisis response.
- *Data Tracking:* Plot inventory and backlog levels to reveal system trends visually
- *Mini Version:* Run a shorter simulation with two or three roles for tight timeframes.

Note

This simulation was developed at *MIT* in the 1950s when Jay W. Forrester collaborated with General Electric to address issues in refrigerator production and distribution. He created a computer model to analyse the supply chain, which later evolved into a board game format. In the early 1960s, *MIT* students adapted this model into a game format, choosing beer as the product for its relatability, leading to the name "Beer Game" [59, 71].

Fishbanks Ltd.

Feedback Loops | Delays | Stocks and Flows | Nonlinearity | Boundaries | Perspectives | Leverage Points

Purpose

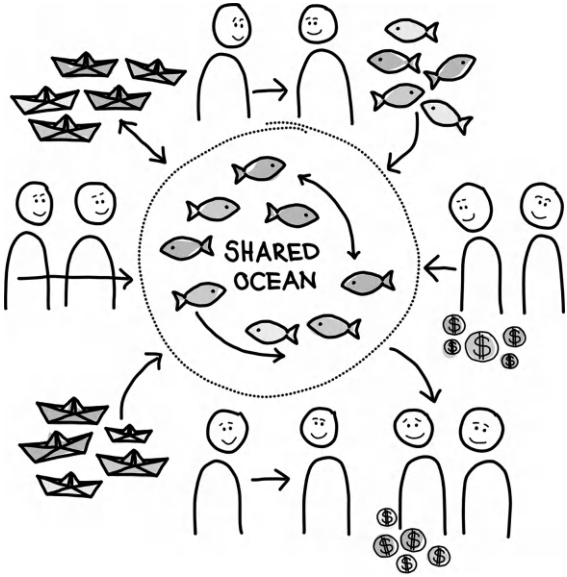
This simulation developed by Dennis Meadows and colleagues [60] allows participants to experience how individual incentives, limited visibility, and delayed consequences can lead to overuse of shared resources. It shows how competition, lack of coordination, and short-term decisions often undermine sustainability – even when the long-term goal is shared.

How It Works

Participants run fishing companies in a shared ocean. Each round, they decide how many boats to deploy, where to fish, and whether to invest in assets. The fish population regenerates based on remaining stocks, but overfishing reduces yields in later rounds. Players must manage both money and resources as the system responds slowly and collectively to their actions.

Applications

Useful in sustainability education, resource management, systems thinking, and policy. It supports experiential learning and shows how delays and uncoordinated actions affect shared systems. It works well in mixed groups or when exploring collective action challenges.



Exercise: "Fishbanks Ltd."

Participants	Time	Equipment
6–30	60–90 minutes	Role sheets, ocean board or grid, fish tokens, boat tokens, money counters, score sheets

Space: Tables for teams and a central area for the shared ocean board.

Setup

1. Divide participants into small teams as fishing companies.
2. Provide each team with a starting set of boats, money, and score sheets.
3. Set up the ocean board with fish tokens placed across zones.
4. Prepare a clear system for tracking fish regeneration and player actions each round.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that each team runs a fishing company competing in a shared ocean.
   - Emphasize that fish regenerate, but overfishing leads to collapse.
   - Clarify that teams act independently but share the same resource.
2. **Run first round (5 minutes)**
   - Teams choose where to deploy boats and how many.
   - Catch is based on fish levels in each zone.
   - Teams update money and decide whether to invest in new boats or save.
3. **Continue gameplay (20–30 minutes)**
   - Repeat for multiple rounds (typically 8–12).
   - The facilitator updates fish populations after each round.
   - Let behaviour evolve; some teams may cooperate, others compete.
4. **Wrap-up round (5 minutes)**
   - Play a final round and record total wealth and remaining fish stocks.
   - Prepare for discussion by showing outcomes clearly.
5. **Debriefing (15 minutes)**
   - Reflect on when the system began to show stress or decline.
   - Ask how feedback, delay, and competition shaped behaviour.
   - Explore what participants would do differently with foresight or cooperation.

Tips for Facilitators

Let participants make decisions independently without giving hints or steering strategy. Allow overfishing to happen if it's going to; this helps reveal system limits and consequences. Keep fish population updates and team outcomes visible each round to reinforce shared impact. Encourage natural competition or collaboration without enforcing either.

Tips for Debriefing

Create space for open reflection. Use guiding questions to help participants connect their experience to larger systems:

- What guided your team's decisions during the game?
- When did you realize fish levels were dropping?
- Did anyone attempt to cooperate? What happened?
- How do delays in system feedback influence decision-making?
- What does this simulation reveal about managing shared resources?

Summarize key insights about system collapse, delayed impact, and how group dynamics and structure influence outcomes – often more than individual intent.

Variations

Fishbanks Ltd. can be adapted to suit different contexts and objectives:

- *Policy layer:* Introduce quotas, taxes, or cooperative agreements mid-game.
- *Role additions:* Assign a regulator, scientist, or observer to shape decisions or provide feedback.
- *Short format:* Reduce rounds or team sizes for tight schedules.
- *Visual mapping:* Use a causal loop diagram after gameplay to unpack behaviour.
- *Digital version:* Use a spreadsheet or online simulator to streamline tracking and speed up rounds.

Note

Fishbanks Ltd. was developed by Dennis Meadows and colleagues [60] as part of systems thinking education at Dartmouth College. It's a widely used simulations to explore sustainability, delayed effects, and feedback in shared systems.

Sankey Diagrams

Stocks and Flows | Interconnectedness | Leverage Points

Purpose

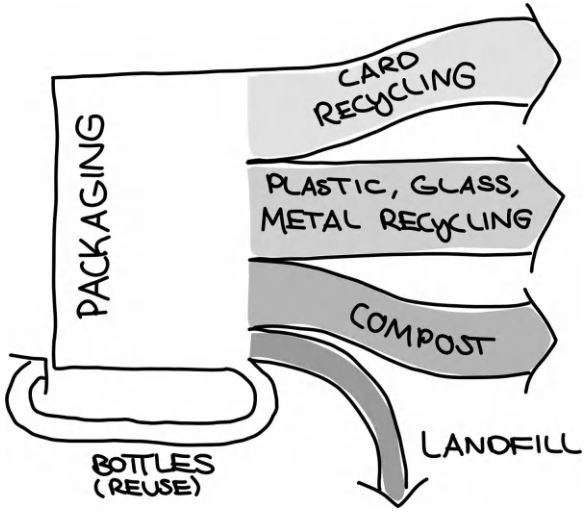
The goal of this exercise is to help participants visualize how resources, materials, or energy flow through a system, highlighting the relative quantities and pathways of these flows. This allows for a clearer understanding of inefficiencies and opportunities for optimization.

How It Works

Participants create a diagram using boxes to represent system elements and arrows of varying thickness to depict the flow of resources between them. Thicker arrows represent larger flows, while thinner arrows show smaller flows, making it easy to see where the majority of resources are going.

Applications

This exercise is particularly useful in fields like energy management, supply chain logistics, environmental studies, and process engineering. It helps participants develop a comprehensive view of resource flows, making it easier to spot inefficiencies or areas for improvement.



Exercise: "Sankey Diagrams"

Participants	**Time**	**Equipment**
3–5	45–60 minutes	Large sheets of paper or whiteboard, markers in various colours, ruler

Space **:** Tables or floor space for diagram creation.

Setup

1. Provide participants with paper and markers.
2. Ensure enough space for everyone to create and display their diagrams.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that Sankey Diagrams are used to visualize resource flows within systems.
   - Show an example to clarify the concept.
2. **Identify system elements (5 minutes)**
   - Ask participants to list key elements or stages within the system (e.g., physical locations, processes, or stages).
3. **Determine resource flows (10 minutes)**
   - Identify the resources (e.g., energy, materials) that flow through the system.
   - Discuss the relative quantities of these flows between elements.
4. **Create the diagram (10 minutes)**
   - Draw boxes for each system element.
   - Use arrows to connect the elements, showing the direction of flow.
   - Vary arrow thickness to represent the size of each flow (thicker arrows for larger flows, thinner arrows for smaller ones).
5. **Add details (5 minutes)**
   - Label the flows with their type (e.g., energy, money) and quantity, if known.
   - Use different colours to distinguish between types of flows, if necessary.
6. **Analyse the diagram (10 minutes)**
   - Look at the largest and smallest flows.
   - Identify any bottlenecks or inefficiencies.
   - Discuss any unexpected patterns that emerge.
7. **Debriefing (15 minutes)**
   - Ask participants to individually reflect on their personal learning.
   - Encourage them to think about how creating Sankey Diagrams influenced their understanding of the problem and different perspectives.

Tips for Facilitators

Encourage participants to focus on both the size of the resource flows and the connections between elements. Highlight how this visualization can reveal inefficiencies or areas for optimization that might not be immediately obvious. Guide discussions toward real-world applications, such as supply chains or energy usage.

Tips for Debriefing

Create a positive environment for reflection. Ask participants to consider how the diagram helped them understand the system more deeply. Use these questions to guide the discussion:

- What new insights did the diagram reveal about resource flows?
- Were there any bottlenecks or inefficiencies you hadn't noticed before?
- How can these insights help inform decision-making or resource allocation?
- What potential improvements to the system could be made based on the diagram?
- How do the visualized flows reflect real-world systems you work with or are familiar with?

Summarize the key points by emphasizing the value of visualizing flows to see where resources are concentrated or lost. Encourage participants to think about how they can apply these insights in their own work or projects.

Variations

Sankey Diagrams can be adapted to fit different contexts or group sizes:

- *Multiple resources*: Track several types of resources (e.g., energy, materials, money) using different colours for each flow.
- *Complex systems*: Add more elements and branches to show sub-flows or more detailed system connections.
- *Digital tools*: Use software to create more complex Sankey Diagrams, allowing for greater precision and easier updates as the system evolves.
- *Collaborative diagrams*: Have groups work together to combine their knowledge into one larger, more complex Sankey Diagram, integrating multiple perspectives on the same system.

System in Focus

Boundaries | Perspectives | Interconnectedness

Purpose

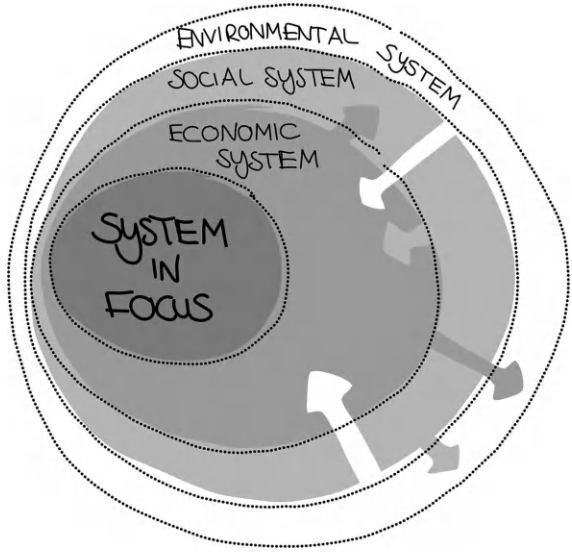
This method helps participants define the system they're working with, where its boundaries lie, and what flows in or out. It clarifies what's being examined, what's included, what's excluded, and why. This supports deeper understanding, surfaces assumptions, and provides a clear basis for mapping or assessment. It's a grounding method, simple, visual, and often revealing.

How It Works

Participants choose a real system (product, process, organization, location) and place it "in focus." They then sketch what exists inside the system and what lies outside it. Arrows show the movement of resources, information, or people into and out of the system. This creates a visible picture of the boundary choices made – and opens up reflection about what those choices mean.

Applications

Useful early in any systems process, especially before deeper mapping. It supports stakeholder alignment, scope-setting, circular economy analysis, sustainability work, or project planning. It helps where people may not share the same view of what the "system" is.



Exercise: "System in Focus"

Participants	Time	Equipment
2–20	30–45 minutes	Large sheets of paper, pens, sticky notes

Space : Tables or floor space for group work and drawing.

Setup

1. Organize participants into pairs or small groups.
2. Provide each group with paper and pens.
3. Ensure enough space for groups to draw and review their diagrams together.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the goal of this exercise is to map and define a system and its interactions beyond its boundaries.
   - Mention that systems sit within economic, social, and environmental contexts.
2. **Define the system (5 minutes)**
   - Ask each group to pick a real-world system (e.g., product, service, organization).
   - Write the system name in the centre of the page.
3. **Draw the boundary (5 minutes)**
   - Draw a clear boundary (box or circle) around the system.
   - Inside, list the key components, actors, or activities.
4. **Add Inflows and outflows (10 minutes)**
   - Use arrows to show what enters (e.g., raw materials, people, information) and exits (e.g., waste, emissions, services, decisions) the system.
   - Label these flows clearly.
5. **Draw surrounding systems (10 minutes)**
   - Draw three surrounding layers:
     i. Economic system – e.g., markets, suppliers, customers, regulation.
     ii. Social system – e.g., workers, communities, users, social norms.
     iii. Environmental system – e.g., natural resources, climate, emissions.
   - Use arrows to show how the system in focus interacts with each of these:
     i. What does it take from them? What does it send back?
6. **Debriefing (15 minutes)**
   - Ask each group to reflect on how their view of the system changed as they added the surrounding layers.
   - Discuss how boundaries shape our attention and what we leave out.

Tips for Facilitators

Encourage participants to treat the economic, social, and environmental systems as active parts of the picture – not background context. Help them identify specific relationships, not just label the layers. For example: "The economic system provides funding," or "The environmental system supplies water and absorbs emissions." Push for clarity on flows and boundaries. If groups are unsure where to draw the line, ask: "What are you trying to understand or influence?"

Support flexibility. Some teams might start with a narrow boundary, others with a broad one – that's okay. The point is to make those choices visible and discussable.

Tips for Debriefing

Use these questions to support group reflection:

- What did you choose to include or exclude, and why?
- How do the outer systems shape what happens inside your system?
- Were there connections or influences you hadn't considered before?
- Which parts of your system seem most sensitive to external change?
- How might someone else define this system differently?

Encourage teams to compare diagrams. Seeing how others framed the same system often reveals hidden assumptions or blind spots.

Variations

System in Focus can be adapted for different purposes or group setups:

- *Stakeholder view*: Redraw the system from the perspective of a user, supplier, or policymaker to reveal different boundaries and concerns.
- *Zoom in/out*: Apply the method at a smaller or larger scale to explore subsystems or broader contexts.
- *Compare diagrams*: Have multiple groups define the same system separately, then compare results to surface assumptions.
- *Live mapping*: Build one system map together on a whiteboard, collecting input from across the group.
- *Time shift*: Sketch how the system looked in the past or how it might change in the future to explore change over time.

Note

This method is grounded in systems thinking and circular economy practice. It reflects boundary-setting approaches found in ISO 59004 [94] and draws on principles of Boundary Critique [22], encouraging reflection on what is included, excluded, and why.

Rich Pictures

Perspectives | Interconnectedness | Boundaries

Purpose

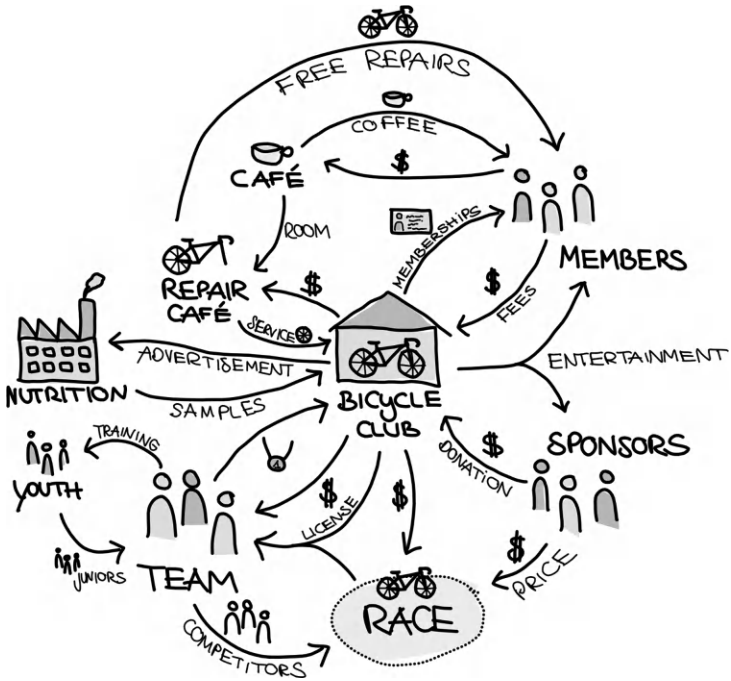
Rich Pictures, introduced by Peter Checkland [64] as part of Soft Systems Methodology, help participants explore complex situations by drawing the people, processes, and relationships involved. They make different perspectives visible and surface hidden tensions or assumptions – especially helpful at the start of problem-solving or when aligning stakeholders.

How It Works

Participants work in small groups with large paper and markers. They sketch the situation using symbols, text, and arrows to show connections. Each group then presents their picture to others, helping share views and spark discussion.

Applications

Rich Pictures are used in workshops on strategy, change, education, or community planning. They help teams see the bigger picture, uncover assumptions, and build shared understanding before moving into analysis or planning.



Exercise: "Rich Pictures"

Participants	Time	Equipment
4–10	40–90 minutes	Large sheets of paper, markers, crayons, coloured pencils, stickers (optional)

Space: A room with enough space for participants to work in groups and create large visual representations.

Setup

1. Prepare large sheets of paper for each group.
2. Arrange markers, crayons, and other drawing materials within easy reach.
3. Ensure enough space for groups to spread out and work comfortably.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose and significance of Rich Pictures.
   - Provide examples of symbols and metaphors participants can use to represent elements of the problem.
2. **Brainstorming and drawing (10–30 minutes)**
   - Ask participants to brainstorm key elements of the problem situation.
   - Encourage them to use symbols, drawings, and text to represent these elements on the large sheets of paper.
3. **Adding detail (5 minutes)**
   - Guide participants to add relationships and interactions between different elements.
   - Encourage the use of colours, stickers, and decorative items to enrich the visual representation.
4. **Group presentations (5–20 minutes)**
   - Have each group present their Rich Picture to the rest of the participants.
   - Encourage questions and discussions to explore different perspectives.
5. **Debriefing (15 minutes)**
   - Ask participants to individually reflect on their personal learning from the exercise.
   - Encourage them to think about how creating Rich Pictures influenced their understanding of the problem and different perspectives.

Tips for Facilitators

Encourage creativity and the use of symbols and metaphors to enrich the visual representation. Foster open discussion and collaboration to ensure all perspectives are represented and understood. During group presentations, guide the group toward actionable insights and agreement on key elements.

Tips for Debriefing

Create a positive environment focused on learning. Ask participants to reflect on how the elements and relationships depicted in their Rich Pictures helped them understand the problem better. Use questions such as the following:

- What key elements did you include in your Rich Picture?
- How do these elements interact within the system?
- How did different perspectives influence your Rich Picture?
- What patterns or themes emerged from your Rich Picture?
- What assumptions did you challenge or confirm through this exercise?
- How can the insights inform your decision-making?

Summarize key points, highlight important elements and relationships, and link insights to real-world applications. Ask participants to identify specific, measurable actions based on their learning.

Variations

Rich Pictures can be easily adapted to fit different group sizes or goals, making the exercise more engaging and flexible:

- *Tactile elements*: Use cutouts, images, or stickers instead of just drawing. This can spark creativity, especially for participants less comfortable with drawing.
- *Subgroup focus*: Divide participants into smaller groups, each working on a specific part of the problem. Then combine their work into one larger Rich Picture to integrate different perspectives.
- *Silent drawing*: Have participants add to the picture in silence. This often leads to unexpected insights and encourages reflection on assumptions.
- *Progressive updates*: Revisit the Rich Picture as new information emerges. This keeps it dynamic and tracks evolving understandings of the problem.

Note

Rich Pictures were first introduced as part of Soft Systems Methodology (SSM), developed by Peter Checkland in the 1970s to address complex, ill-structured problems [64].

Double-Q Diagram

Interconnectedness | Boundaries | Perspectives | Leverage Points | Delays | Nonlinearity

Purpose

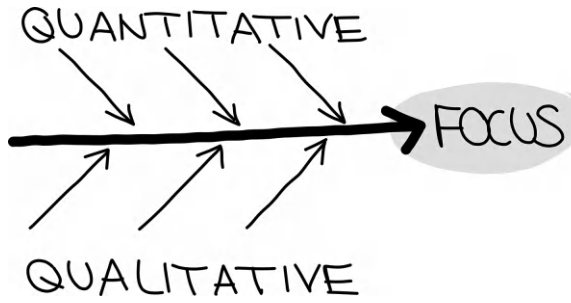
The Double-Q Diagram, introduced by Daniel H. Kim [95], is a structured tool that maps both quantitative ("hard") and qualitative ("soft") causes of a central issue. It helps participants see both data and human factors side by side – supporting a more complete systems view. Based on the traditional fishbone diagram, this method supports balanced thinking by separating measurable data from subjective or human-cantered causes.

How It Works

A central horizontal arrow points toward a key issue or outcome. From the top of the arrow, participants draw branches for quantitative factors – things that can be measured or counted. From the bottom, they draw qualitative factors – things related to behaviour, values, perceptions, or culture. Sub-factors can branch off each major factor. This layout shows both sides of a system clearly, keeping attention evenly distributed and preventing bias toward either side.

Applications

Double-Q Diagrams can be used in workshops focused on systems analysis, organizational learning, education, quality improvement, and leadership development. It supports clear, structured brainstorming and prepares teams to explore system dynamics using other tools like causal loops or trend analysis.



Exercise: "Double-Q Diagram"

Participants	**Time**	**Equipment**
3–10	30–50 minutes	Large sheet of paper or whiteboard, markers, sticky notes

Space : A table or wall where participants can collaboratively create and view the diagram.

Setup

1. Prepare a large sheet of paper for each group, and draw a horizontal arrow pointing right, labelling the arrowhead with the central issue.
2. Provide sticky notes and markers so participants can write and move causes easily during the session.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the Double-Q Diagram is based on the classic fishbone but separates quantitative (hard) and qualitative (soft) factors.
   - Emphasize its purpose: to "see the whole system" by making both types of causes equally visible and balanced.
2. **Identifying major factors (10–15 minutes)**
   - Begin with a group brainstorm. Participants write down major causes – both measurable (e.g., data, tools) and non-measurable (e.g., behaviour, morale) – on sticky notes.
   - Place quantitative causes above and qualitative causes below the arrow.
   - Label them as main factors, and use both sides of the diagram.
3. **Adding sub factors (15 minutes)**
   - Ask participants to expand each main factor by identifying sub-factors and adding them as branches.
   - If any area becomes too complex, suggest turning a sub-factor into a new major factor to keep the structure clear.
4. **Group presentations (5–20 minutes)**
   - Participants present and review the full diagram.
   - Let them shift or reclassify items as needed for clarity and balance.
   - Identify where the diagram feels overloaded or thin; this often reveals blind spots or dominant thinking patterns.
5. **Debriefing (15 minutes)**
   - Ask participants to reflect on their personal learning from the exercise.
   - Encourage them to think about how creating the Double-Q Diagram influenced their understanding of the problem and different perspectives.

Tips for Facilitators

Encourage balanced contributions by prompting participants to consider both quantitative (hard) and qualitative (soft) causes. Guide the group to focus on understanding the system, not solving it. Use sticky notes to keep the diagram flexible; participants should feel free to move or adjust items as the discussion unfolds. Ask clarifying questions to uncover overlooked factors or assumptions. Encourage reflection on how the map can support further analysis using tools like Behaviour Over Time Diagrams or Causal Loop Diagrams.

Tips for Debriefing

Create a space where participants can reflect openly on their thinking. Invite them to consider how separating hard and soft factors affected their view of the problem. Use questions such as the following:

- What causes were easiest or hardest to identify?
- Did the group lean more toward hard or soft factors? Why?
- Were there any surprises or disagreements during the process?
- How did the sticky note format help or limit your thinking?
- What patterns, clusters, or gaps stood out?
- Which areas might need deeper exploration or more data?
- How might this diagram shape your next steps or decisions?

Summarize key themes and encourage participants to link the insights from the diagram to real-world problems, decisions, or strategy. Emphasize how balanced mapping can improve systems thinking and team discussions.

Variations

Double-Q Diagramming can be adapted to fit different needs and group styles:

- *Weighted causes:* Use different sizes, colours, or shapes of sticky notes to show level of impact, certainty, or urgency.
- *Role-based input:* Assign roles (e.g., team lead, customer, analyst) and have participants contribute causes from those perspectives.
- *Time and perspective:* Add a timeline or symbols to mark short-term vs. long-term factors.
- *Silent mapping:* Begin with quiet individual contributions before group discussion; this often surfaces more diverse input.
- *Digital tools:* Use virtual whiteboards for remote collaboration; participants can drag and organize sticky-style elements in real time.
- *Live iteration:* Revisit the diagram during a project to reflect changes, add insights, or shift priorities. This keeps the map dynamic and responsive.

Impact Mapping

Perspectives | Interconnectedness | Leverage Points

Purpose

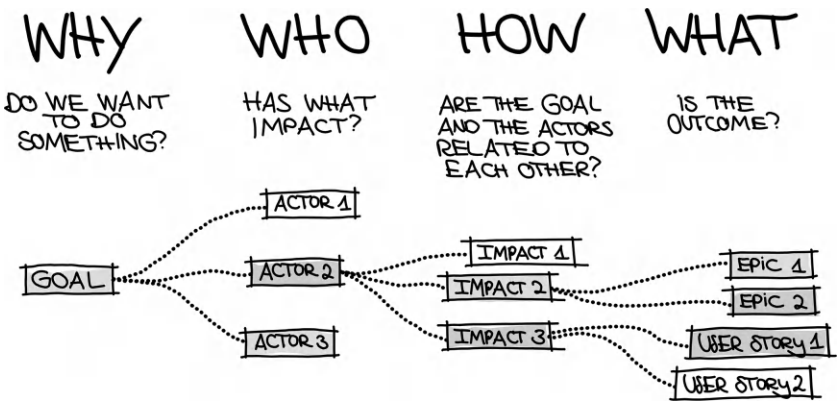
Impact Mapping, popularized by Gojko Adzic [96], helps teams visualize how actions, stakeholders, and resources contribute to achieving a central goal. It ensures that activities are purposeful and aligned with broader objectives by showing clear links between interventions and outcomes.

How It Works

Participants start with a central goal, then identify stakeholders and brainstorm the possible impacts they can have. Next, they map specific actions or activities that stakeholders can take to drive those impacts. The result is a visual map connecting goals, stakeholders, impacts, and actions.

Applications

This method is useful for strategic planning, project management, and systems thinking in various fields such as business strategy, organizational development, and community engagement. It helps clarify priorities, align actions with goals, and ensure that all stakeholders contribute meaningfully to the system's success.



Exercise: "Impact Mapping"

Participants	Time	Equipment
5–15	45–60 minutes	Large sheets of paper or a whiteboard, markers, sticky notes (optional)

Space: A room where participants can collaborate on a shared map.

Setup

1. Prepare large paper or a whiteboard for mapping.
2. Ensure markers are easily accessible.
3. Designate space for participants to work together comfortably.

Instructional Steps

1. **Introduction (2 minutes)**
   - Introduce Impact Mapping as a way to connect stakeholders, actions, and goals.
   - Explain that it helps identify high-impact actions that support the objective.
2. **Write a goal (10 minutes)**
   - Write the central goal on the board or paper. Ensure everyone agrees it.
   - Encourage participants to clarify what success looks like for this goal.
3. **Identify stakeholders (15 minutes)**
   - Ask participants to brainstorm all relevant stakeholders who are involved in or impacted by the goal.
   - Write these stakeholders around the goal and draw lines connecting them to the goal.
4. **Brainstorm impacts (10–15 minutes)**
   - For each stakeholder, discuss the potential impacts they can have on the goal.
   - Write the impacts on sticky notes or around the stakeholders, showing how they influence the system.
5. **Map activities (15 minutes)**
   - Identify specific actions or activities that stakeholders can take to help achieve the goal.
   - Add these actions to the map, connecting them to the impacts and stakeholders they influence.
6. **Debriefing (15 minutes)**
   - Discuss the insights gained from the Impact Mapping.
   - Encourage participants to discuss actions they can prioritize moving forward.

Tips for Facilitators

Encourage open discussions when mapping stakeholders, ensuring participants think critically about how each stakeholder influences the system. Guide participants to focus on high-impact actions, and consider both short-term and long-term effects of those actions.

Tips for Debriefing

Create a positive environment for reflection, and use questions to deepen understanding:

- How well do the mapped actions align with the goal?
- Were any key stakeholders or actions missed?
- What actions will have the most significant impact?
- How can these insights guide future decision-making and planning?

Summarize key takeaways and encourage participants to connect the map to real-world projects, setting clear goals for the next steps.

Variations

- *Digital Impact Mapping*: Use online tools like Miro or MURAL to collaborate in real-time for remote or hybrid teams.
- *Simplified Version*: Focus on stakeholders and key impacts in shorter sessions, leaving detailed action mapping for future discussions.
- *Multiple Goals*: For more complex systems, create smaller maps for different goals and then connect them to see overlaps and synergies.

Connected Circles Map

Interconnectedness | Feedback Loops | Leverage Points

Purpose

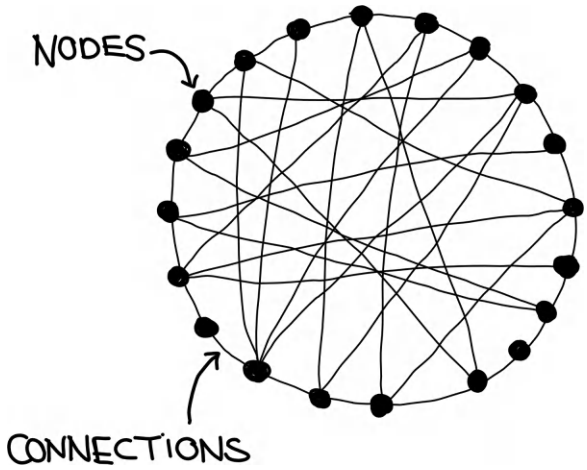
The Connected Circles Map is designed to help participants visualize and clarify the root causes of complex problems within a system. This technique encourages brainstorming on potential changes and illustrates the network of relationships between system elements. It's particularly useful after creating a Cluster Map, as it focuses on the interconnections between variables, helping to reveal key areas for intervention.

How It Works

Participants identify key variables that influence the system and arrange them in a circular layout. Arrows are drawn between these variables to show how they influence each other. By labelling the connections, participants can see how various factors are interlinked, enabling a deeper understanding of the system's dynamics and driving future decision-making.

Applications

This method is useful in areas like business strategy, healthcare, environmental planning, and education. It helps clarify relationships between system elements, identify leverage points for change, and assess the potential impact of interventions.



Exercise: "Connected Circles Map"

Participants	Time	Equipment
5–20	60–90 minutes	Large sheets of paper Markers or coloured pens

Space : A room with enough space for participants to spread out and work around a large paper or board.

Setup

1. Prepare large sheets of paper and markers for each group.
2. Ensure that all materials are easily accessible and that participants have enough room to work comfortably.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of the Connected Circles Map.
   - Emphasize how this technique helps identify and visualize the relationships between key factors in a system.
   - Ask participants to draw a large circle on a sheet of paper and add a heading that describes the issue they want to explore.
2. **Defining the system boundary (5 minutes)**
   - Work with participants to agree on the system focus (e.g., "student achievement in school" or "local transport emissions").
   - Clarify what is inside the scope and what is outside to keep the map relevant.
3. **Identifying key variables (15 minutes)**
   - Ask participants to brainstorm and identify the main variables or factors that influence the problem.
   - Write these variables on sticky notes or directly on the paper.
4. **Arranging variables in a circle (10 minutes)**
   - Once the key variables are identified, have participants arrange them evenly around a large circle on the paper.
5. **Drawing connections (10 minutes)**
   - Guide participants to draw lines between the variables to represent the relationships.
6. **Group presentations (15 minutes)**:
   - Have each group present their connected circles to the rest of the participants.
   - Encourage questions and discussions to explore different perspectives.
7. **Debriefing (15 minutes)**
   - Ask participants to reflect on their learning and the connections they identified.

Tips for Facilitators

Encourage participants to think critically about the relationships between variables. Ensure everyone has a chance to contribute and discuss the connections. During group presentations, guide discussions toward identifying leverage points and actionable insights.

Tips for Debriefing

Create a positive environment focused on reflection. Ask participants to consider the key variables they identified and how the relationships affected their understanding of the system. Use questions such as the following:

- What were the most influential variables in your map?
- How did the relationships between variables enhance your understanding of the system?
- Were there any surprising insights or connections?
- What patterns or feedback loops did you notice in the map?
- How could these connections help identify leverage points for future interventions?
- What additional variables or relationships would help refine your map?
- How can these insights inform your decision-making and strategic planning?

Summarize the discussion, highlighting the most important variables and relationships. Encourage participants to connect these insights to real-world systems and share examples. Finally, ask participants to set specific, measurable goals based on what they've learned and discuss follow-up actions.

Variations

Interconnected Circles Maps can be adapted for different group sizes and contexts:

- *Subgroup Focus*: Participants can work in smaller groups on specific parts of the system, then combine their findings into one larger map.
- *Sticky Notes*: Use sticky notes to allow for flexibility in rearranging variables and connections as relationships are refined.
- *Digital Tools*: Use online whiteboards or mapping software in virtual settings, making it easy to edit connections as new insights arise.
- *Ongoing Mapping*: Revisit the map throughout a project, adjusting and expanding it as new information emerges or the system evolves

Causal Loop Diagram (CLD)

Feedback Loops | Interconnectedness | Leverage Points | Nonlinearity

Purpose

Causal Loop Diagrams (CLDs) help participants visualize how feedback shapes behaviour in complex systems. They show how variables influence each other over time, making it easier to identify reinforcing and balancing loops, locate leverage points, and explore the structure behind recurring patterns or behaviours.

How It Works

Participants collaborate to build a causal map using sticky notes and markers. Each person identifies key variables and places them on a whiteboard or flip chart. Arrows are drawn to show cause-and-effect relationships between variables.

Along each arrow, a "+" or "–" sign is added:

- *"+" (positive)* – both variables move in the same direction.
- *"–" (negative)* – variables move in opposite directions.

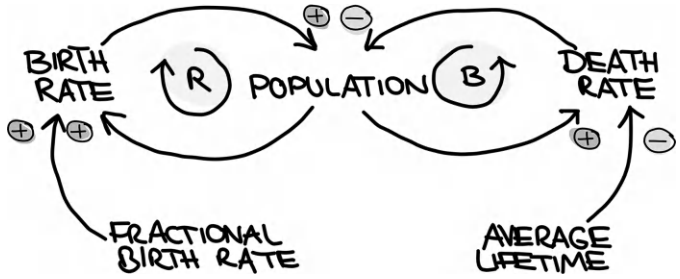
As the diagram grows, feedback loops emerge – closed chains where a change eventually loops back to affect itself. These are labelled as follows:

- *Reinforcing (R)* – changes that amplify over time
- *Balancing (B)* – changes that stabilize the system

This is a qualitative method; it shows structure and dynamics without needing numbers. It helps participants visualize interconnections, understand system behaviour, and spot points for effective intervention.

Applications

CLDs are used across systems thinking, from business and healthcare to education, policy, and environmental analysis. They help teams explore root causes, map dynamic relationships, and improve decisions. This method is especially valuable when building shared understanding of complex challenges.



Exercise "Causal Loop Diagram"

Participants	Time	Equipment
5–20	60–90 minutes	Sticky notes, whiteboard or flip chart paper, markers

Space: A room with enough space for participants to move around and collaborate on a large whiteboard or flip chart.

Setup

1. Prepare a large whiteboard or cover a wall with flip chart paper.
2. Arrange sticky notes and markers within easy reach of participants.
3. Ensure enough space for participants to move and interact with the board.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of CLDs and how they help visualise system behaviour.
   - Introduce the concept of feedback loops (see earlier).
2. **Defining the system boundary (5 minutes)**
   - Work with participants to agree on the system focus (e.g., "student achievement in school" or "local transport emissions").
   - Clarify what is in scope and what is out to keep the map relevant.
3. **Identifying variables (10 minutes)**
   - Ask participants to brainstorm specific, modifiable variables (e.g., "student workload" instead of "students") and write one per sticky note.
   - Place them on the board without connecting them yet.
4. **Drawing connections (15 minutes)**
   - Guide participants in drawing arrows between variables to show cause-and-effect relationships.
   - Emphasize that arrows should represent causality, not just correlation.
5. **Forming feedback loops (10 minutes)**
   - Help the group identify and circle feedback loops in the diagram.
   - Label each loop as reinforcing (R, positive feedback) or balancing (B, negative feedback), and briefly discuss its role.
   - Invite participants to add notes highlighting key arrows or variables.
6. **Present (10 minutes)**
   - Ask each group to present their CLD, highlighting key loops and connections.
7. **Debriefing (15 minutes)**
   - Discuss system behaviour, feedback loops, and possible leverage points.
   - Ask participants to reflect on what surprised them or shifted their thinking.

Tips for Facilitators

Encourage active participation and collaboration throughout the process. Help the group clarify each variable and ensure arrows reflect real cause-and-effect, not just assumptions. As loops begin to form, guide discussion around their significance – especially where reinforcing or balancing dynamics emerge. Keep participants focused on structure, not symptoms, and support the group in identifying meaningful leverage points by the end.

Tips for Debriefing

Start with a positive, open tone focused on learning. Ask participants to reflect on their experience and how drawing the system helped their understanding. Use questions such as the following:

- What key feedback loops did you identify?
- How do these loops influence the system?
- What are the key leverage points?
- How can interventions change the system?
- How can understanding feedback loops improve decision-making?
- What specific actions will you take based on your learning?

Summarize key points from the discussion, focusing on important feedback loops and leverage points. Encourage participants to link insights to real situations and consider how feedback loops affect decisions. Finally, ask them to identify specific actions and set clear, measurable goals.

Variations

Causal Loop Diagrams can be adapted for different needs and group sizes:

- *Predefined Variables*: For quicker sessions, provide predefined variables so participants can focus solely on identifying feedback loops and relationships.
- *Digital Tools*: Use online whiteboarding platforms or software to create and edit diagrams in real-time, making the method adaptable for remote teams.
- *Iterative Diagrams*: Build the diagram in stages, allowing participants to reflect, revise, and add complexity in subsequent rounds, leading to a deeper analysis of the system.
- *Leverage Point Highlighting:* Ask participants to mark potential leverage points for more actionable insights (see Leverage Point Mapping).

Note

When analysing CLDs, it helps to look for common patterns called “Systems Archetypes”

Systems Archetypes

Feedback Loops | Nonlinearity | Perspectives | Leverage Points | Emergence

Purpose

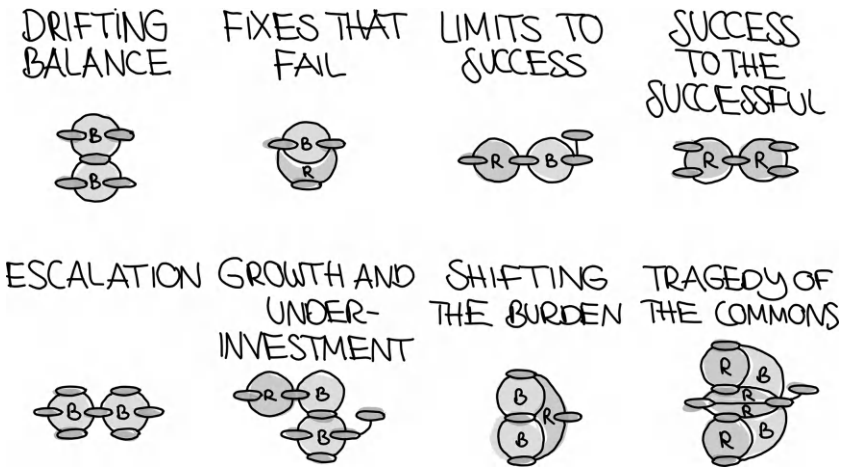
Systems Archetypes, introduced by Peter Senge [52, 89], are standard patterns that show how problems repeat across different systems. They help people see the deeper structure behind issues instead of just reacting to events.

How It Works

Each archetype has distinct characteristics that signal common system behaviours. By recognizing these patterns, organizations and teams can anticipate potential challenges and implement solutions that address the root causes of issues rather than just the symptoms.

Applications

Systems archetypes are valuable in strategic planning, organizational development, project management, and policymaking. Recognizing these patterns enables informed decision-making and proactive measures to improve system performance.



Exercise: "Systems Archetypes"

Participants	**Time**	**Equipment**
5–15	1–1.5 hours	Paper, markers

Space **:** A collaborative space for discussion and visual mapping.

Setup

1. Prepare paper and markers for participants to map out system variables and discuss archetypes.
2. Ensure the space allows for group interaction and brainstorming.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of Systems Archetypes and their role in identifying common behaviour patterns in systems.
   - Highlight the benefits of understanding these patterns for strategic intervention.
2. **Discuss key archetypes (15 minutes)**
   - Introduce and discuss common archetypes:
     i. *Limits to Growth:* Initial growth slows as limits are reached.
     ii. *Fixes that Fail:* Short-term solutions create long-term problems.
     iii. *Shifting the Burden:* Relying on symptomatic solutions over fundamental ones.
     iv. *Success to the Successful:* Initial success leads to continued resource concentration.
     v. *Tragedy of the Commons:* Individual use depletes shared resources.
     vi. *Growth and Underinvestment:* Growth slows due to insufficient capacity investment.
3. **Match patterns to archetypes (20 minutes)**
   - Map key variables and loops as a Causal Loop Diagram (CLD).
   - Compare the structure to known archetypes to spot similar patterns.
4. **Explore Interventions (15 minutes)**
   - Identify actions that address the root causes shown by the archetype.
   - Discuss possible side effects and long-term impact.
5. **Review and debriefing (15 minutes)**
   - Summarize key insights from the CLD and archetype analysis.
   - Ask participants how this changed their view of the system and how they might apply it going forward.

Tips for Facilitators

Encourage participants to keep an open mind and look beyond surface-level issues. Use clear examples of each archetype to illustrate key points. Facilitate collaborative discussions to ensure diverse perspectives are considered. Summarize findings regularly to maintain focus on the main objectives, and guide participants through complex concepts.

Tips for Debriefing

Ask participants to reflect on how the exercise of identifying Systems Archetypes applied to their specific context. Use questions such as the following:

- Which archetypes were most applicable to their system, and why?
- How did recognizing these patterns influence or change their understanding of the system's dynamics and behaviour?
- What interventions could be most effective based on the archetype analysis, and what might be the long-term implications of these interventions?

Encourage participants to share real-world examples where they have observed these archetypes, and discuss strategies to address recurring challenges. This helps them connect their findings to practical applications and builds a shared understanding for future planning. Highlight actionable takeaways to reinforce the value of recognizing Systems Archetypes as a tool for ongoing improvement and problem-solving.

Variations

- *Collaborative mapping:* Split participants into smaller groups to analyse different parts of the system and compare findings.
- *Digital analysis:* Use digital tools, like Miro or Lucidchart, for mapping and sharing archetype analysis in remote sessions.
- *Case study application:* Apply the archetype analysis to a real-world case study to practise identifying patterns and proposing interventions.
- *Layered exploration:* Conduct an additional session focusing on potential future changes and secondary impacts of interventions.

Leverage Point Mapping

Leverage Points | Perspectives | Boundaries

Purpose

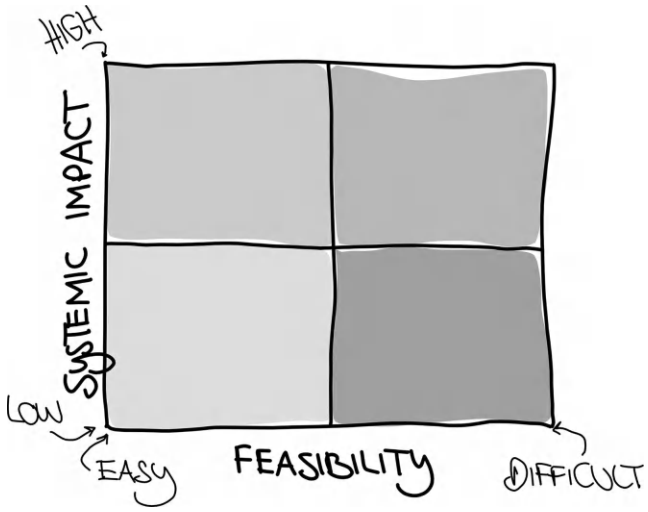
This exercise, inspired by the work of Donella Meadows [73], helps participants identify where to intervene in a system for maximum impact. By mapping leverage points, participants shift their focus from surface-level fixes to deep structural changes. Instead of reacting to symptoms, this method encourages a strategic, high-leverage approach, ensuring interventions create meaningful, lasting transformation.

How It Works

Participants analyse a system they want to change and identify key leverage points – places where small shifts could lead to significant system-wide change. They classify these leverage points based on impact and feasibility, prioritizing interventions that create systemic change with minimal effort.

Applications

Valuable for policymakers, business strategists, sustainability advocates, and social change leaders. It helps ensure interventions are structurally transformative, not just reactive, reducing wasted effort on superficial fixes. Especially useful in systems with deep-rooted resistance, inefficiencies, or unintended consequences from past actions.



Exercise: "Leverage Point Mapping"

Participants	Time	Equipment
2–20	60–75 minutes	Paper, markers, sticky notes, flip charts

Space: A room with space for participants to work in teams and visualize their system map.

Setup

1. Participants work individually or in small groups.
2. Provide a workspace with flip charts, markers, or sticky notes for the exercise.

Instructional Steps

1. **Introduction (5 minutes)**
   - Explain the goal of identifying high-impact intervention/leverage points.
   - Encourage to think in terms of system shifts rather than isolated changes.
2. **Define the system (20 minutes)**
   - Participants map the system's key elements (e.g., policies, structures, behaviours, incentives) using sticky notes.
   - Choose a mapping approach:
     i. *Iceberg Model* (events, patterns, structures, mental models), or
     ii. *Causal Loop Diagram* (variables, connections, feedbacks).
   - As you map, also mark *existing or past interventions* and briefly note which worked, which didn't, and why.
3. **Locate leverage points (15 minutes)**
   - Introduce the concept of Leverage (see Part 1: Finding Leverage and Acting in Systems).
     i. Shallow: Small tweaks with minimal impact (e.g., policies).
     ii. Medium: Structural shifts (e.g., incentives, power dynamics).
     iii. Deep: Fundamental transformation (e.g., mindsets, paradigms).
   - Participants identify leverage points where change could trigger system shifts.
4. **Prioritize action (10 minutes)**
   - Have participants evaluate leverage points based on two criteria:
     i. Systemic Impact (low vs. high).
     ii. Feasibility (easy vs. difficult to implement).
   - Using a 2 × 2 matrix, participants rank leverage points and identify high-impact, feasible interventions.
6. **Debriefing (15 minutes)**
   - Ask participants to reflect on how their understanding of intervention shifted.
   - Facilitate a discussion about leverage points and barriers.

Tips for Facilitators

Encourage participants to move beyond quick fixes toward deeper systemic interventions. Guide them to select leverage points for their impact, not their ease, and to reflect on unintended consequences. Even well-placed actions can backfire without a full systems view. These questions might help:

- What else might this change affect in the system?
- Who might be impacted in unexpected ways?
- Are there delayed or hidden effects?

Keep the discussion grounded in real-world context, balancing feasibility with long-term impact.

Tips for Debriefing

Create a reflective space and encourage participants to connect the exercise with real-world system interventions. Use these questions to guide the discussion:

- How did this approach change your thinking about intervention?
- Were there any surprising insights about how systems resist change?
- What past interventions failed due to focusing on the wrong leverage points?
- What first steps can be taken to act on a leverage point?

Close by summarizing key takeaways and encouraging participants to apply insights to real efforts for lasting systemic change.

Variations

Leverage Point Mapping can be adapted to different goals, timelines, or groups while keeping its focus on high-impact change.

- *Stakeholder perspectives:* Participants analyse leverage points from different system actors' viewpoints to reveal hidden power dynamics.
- *Leverage point voting:* After identifying leverage points, participants vote on the top three to prioritize for action.
- *Scenario testing:* Teams explore how different leverage points interact and predict unintended consequences to refine their approach.

Note

Meadows never offered a formal "mapping" method, only a ranking of leverage points, cautioning it was *"not a recipe . . . but an invitation to think more broadly about system change" [73]*. For facilitation, the Iceberg Model or Causal Loop Diagram work well to translate her insights into group practice.

Scenario Planning

Interconnectedness | Feedback Loops | Boundaries | Perspectives | Leverage Points

Purpose

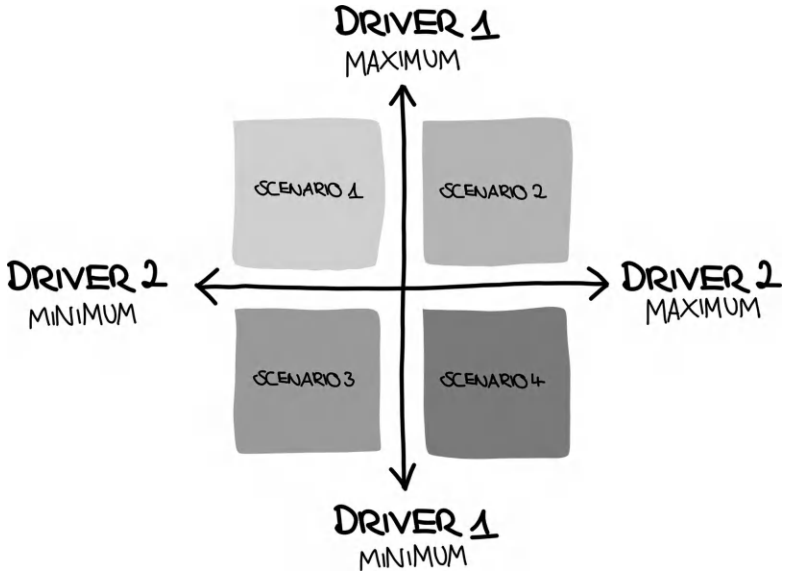
This exercise helps participants explore multiple plausible future scenarios based on key uncertainties. By developing a range of potential futures, participants can prepare for various possibilities and make more robust, flexible decisions.

How It Works

Participants begin by identifying key drivers of change and areas of uncertainty that could shape the future. As a group, they select two critical uncertainties to create a 2 × 2 scenario matrix. Each quadrant represents a distinct future. Teams then develop the details of each scenario, name it, and explore how different stakeholders are affected. Finally, the group reflects on patterns, strategic implications, and potential actions that make sense across multiple futures.

Applications

This method is useful in strategic planning, risk management, and long-term decision-making across fields such as business, policymaking, urban planning, and environmental management. It helps organizations move beyond linear forecasting and develop resilient strategies.



Exercise: "Scenario Planning"

Participants	Time	Equipment
6–12 (can be adapted for larger groups by creating subgroups)	1.5–2.5 hours	Large sheets of paper, markers in various colours

Space : A room with enough space for participants to work in groups.

Setup

1. Provide each group with large sheets of paper, markers, and sticky notes.
2. Ensure enough space for group work and scenario presentations.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that this method explores possible futures, not predicts them.
   - Emphasize the role of preparing for uncertainty in strategic thinking.
2. **Identifying key factors (20 minutes)**
   - Ask participants to brainstorm key factors that could significantly impact the future of the topic or organization.
   - Write each factor on a sticky note, and place them on a wall or board.
3. **Prioritize uncertainties (15 minutes)**
   - Group similar factors together (make clusters).
   - As a group, select the two most important and uncertain key factors.
4. **Create scenario matrix (5 minutes)**
   - Draw a 2 × 2 matrix on a large sheet of paper.
   - Label axes with the key uncertainties; opposite extremes at each end.
5. **Develop scenarios (45 minutes)**
   - In subgroups, develop one scenario per quadrant of the matrix.
   - Name each scenario and describe what the world looks like in it.
   - Consider how different stakeholders are affected.
6. **Explore implications and strategies (30 minutes)**
   - In small groups, ask participants to further develop each scenario:
     i. What events led to this future?
     ii. What challenges and opportunities exist?
     iii. How might different stakeholders react?
7. **Present scenarios (20 minutes)**
   - Ask each group to present their scenarios to the rest of the participants.
8. **Debriefing (15 minutes)**
   - Facilitate a discussion on insights from the scenarios and their application to ongoing planning and decision-making.

Tips for Facilitators

Encourage participants to keep an open mind, and think broadly about possible futures. Make sure everyone has a chance to contribute ideas. During group presentations, guide discussions toward actionable insights, and help identify common themes across scenarios.

Tips for Debriefing

Create a positive, reflective environment. Ask participants to consider how the scenarios developed during the exercise change their perspective on future uncertainties. Use these questions to guide the discussion:

- What key factors drove the scenarios?
- What common themes emerged across the different futures?
- How can these insights improve our strategic planning?
- What "no-regret" moves can be implemented across all scenarios?
- How might this change our approach to uncertainty management?

Summarize the key points from the discussion, and encourage participants to connect the insights to their real-world challenges. Finally, ask them to set specific, measurable actions to integrate scenario planning into their future decision-making processes.

Variations

Scenario Planning can be adapted to fit different contexts or group sizes:

- *Predefined uncertainties*: For quicker sessions, provide participants with predefined uncertainties to focus on developing the scenarios faster.
- *Stakeholder-specific scenarios*: Develop scenarios that focus on the impact on specific stakeholders, such as customers or employees.
- *Quantitative scenarios*: For deeper analysis, combine qualitative scenarios with quantitative data to model potential outcomes.
- *Digital tools*: Use online whiteboards or scenario-planning software for remote sessions or more collaborative engagement.

Note

This exercise draws on the scenario planning methods developed by Pierre Wack at Royal Dutch Shell [50]. It is designed to support strategic thinking under uncertainty by exploring multiple plausible futures.

World Game

Interconnectedness | Feedback Loops | Leverage Points | Perspectives | Boundaries

Purpose

The World Game, developed by Buckminster Fuller [97], is a collaborative simulation designed to help participants understand and address global challenges through systems thinking. It encourages players to work together to devise strategies that "make the world work for 100% of humanity in the shortest possible time, through spontaneous cooperation, without ecological offense or disadvantage to anyone".

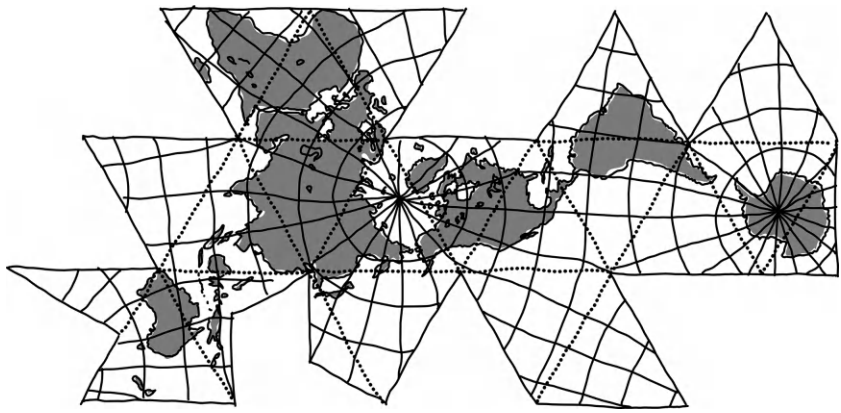
How It Works

Participants engage in a role-playing exercise, often using a large-scale Dymaxion map, to analyse and solve complex global issues. By simulating real-world systems and resource distributions, players explore the interdependencies and feedback loops that influence global outcomes.

The use of a Dymaxion map is especially helpful, as it reduces distortion and removes the idea of "top" or "bottom." It shows Earth as one connected system, helping participants think globally, not nationally.

Applications

The World Game is applicable in educational settings, policy development, and organizational strategy. It serves as a tool to foster holistic thinking, collaborative problem-solving, and a deeper understanding of global systems and their interconnected challenges.



Exercise "World Game"

Participants	Time	Equipment
10–100	60–120 minutes+	Large Dymaxion map, role cards, resource tokens, data sheets, markers

Space: A spacious area to accommodate the large map and facilitate group movement and interaction.

Setup

1. Lay out a Dymaxion map on the floor or a large table.
2. Assign roles to participants, representing various global stakeholders (e.g., nations, NGOs, industries).
3. Distribute resource tokens and data sheets corresponding to each role.
4. Provide markers and other materials for tracking decisions and outcomes.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the objectives and rules of the World Game.
   - Emphasize the importance of cooperation and systems thinking.
2. **Scenario Presentation (5 minutes)**
   - Introduce a global challenge scenario (e.g., climate change, resource scarcity).
   - Provide relevant data and context for the scenario.
3. **Strategy Development (30 minutes)**
   - In role-based groups, analyse the scenario and develop strategies to address the challenge.
   - Encourage consideration of systemic impacts and interdependencies.
4. **Simulation and Negotiation (30 minutes)**
   - Implement strategies on the map, negotiating with other groups as needed.
   - Monitor the effects of decisions on the global system.
5. **Debriefing (15 minutes)**
   - Reflect on the outcomes of the simulation.
   - Discuss insights gained about global systems, cooperation, and leverage points.

Tips for Facilitators

Encourage participants to take a global, long-range view. This method works best when people move beyond immediate interests and consider shared outcomes. Support use of real data, but emphasise that the goal is insight, not perfection. Let patterns emerge from the interaction, rather than pushing for quick solutions. Guide the room to notice interdependencies and ask "what-if" questions. Keep the space open for cross-role dialogue, and be ready to slow down if negotiations get stuck in local views. The map is a thinking surface; use it for collective sense-making.

Tips for Debriefing

Use the debrief to help participants connect their decisions to global systems and real-world challenges. Ask questions such as the following:

- What assumptions shaped your strategy?
- Where did your group cooperate, and where did it compete?
- What changed as you saw other groups act?
- What parts of the system were hardest to shift – and why?

Help the group reflect on how global challenges are shaped by structure, access, and interdependence. Emphasize that seeing the system clearly is often the first step toward better decisions.

Variations

World Game can be shaped to fit different goals, timeframes, and groups:

- *Single-issue game:* Tackle one global challenge like water, food, or migration.
- *Role rotation:* Let participants switch roles mid-game to explore new perspectives.
- *Data-rich version:* Include *UN* data, national statistics, or carbon metrics to anchor decisions.
- *Narrative twist:* Frame the scenario as a future history – looking back on how humanity solved it.

Note

The World Game was developed as an alternative to war games, promoting peace and sustainability through cooperation. It applies Fuller's principles of anticipatory design science and uses the Dymaxion map to better reflect global relationships. This simplified version is adapted for education and workshops, focusing on cooperation, systems thinking, and global resource planning.

Soft Systems Methodology (SSM)

Perspectives | Boundaries | Interconnectedness | Feedback Loops

Purpose

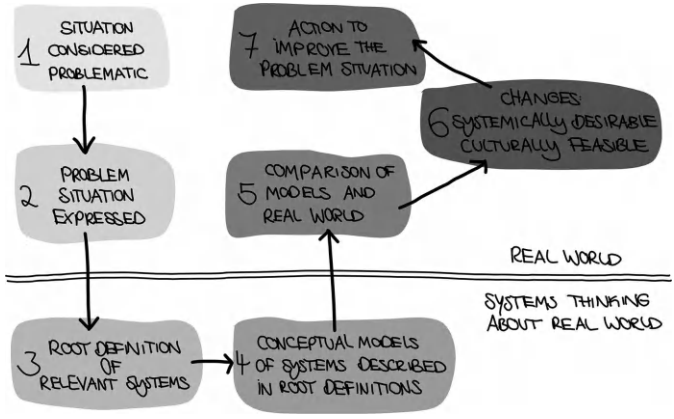
Soft Systems Methodology (SSM), developed by Peter Checkland [32], is a flexible, structured approach. It combines tools to help groups make sense of complex, messy situations. It is used where problems are unclear, contested, or defined differently by different people. Rather than aiming for a single solution, SSM helps compare perspectives, clarify assumptions, and build shared understanding of what change is possible and meaningful.

How It Works

SSM combines methods into a step-by-step learning process. It begins by exploring how people view the situation, often using discussion and Rich Pictures. CATWOE and Root Definitions are then used to describe purposeful activity. These feed into conceptual models, which are compared with real-world behaviour. Through this process, participants identify useful changes, debate priorities, and agree on realistic actions. The process reveals values, contradictions, and possibilities – and supports collaborative decision-making

Applications

SSM is used in organisational change, public services, policy, and community settings. It is helpful when stakeholders have conflicting views, or when understanding purpose and values is needed before planning. SSM supports careful thinking, shared insight, and responsible action – a strong foundation for working with complexity.


1 SITUATION CONSIDERED PROBLEMATIC
2 PROBLEM SITUATION EXPRESSED
3 ROOT DEFINITION OF RELEVANT SYSTEMS
4 CONCEPTUAL MODELS OF SYSTEMS DESCRIBED IN ROOT DEFINITIONS
5 COMPARISON OF MODELS AND REAL WORLD
6 CHANGES: SYSTEMICALLY DESIRABLE CULTURALLY FEASIBLE
7 ACTION TO IMPROVE THE PROBLEM SITUATION
REAL WORLD
SYSTEMS THINKING ABOUT REAL WORLD

Exercise "Soft Systems Methodology"

Participants	Time	Equipment
5–20	90 minutes+	Paper, markers, notes

Space **:** A room with open wall space and tables for small group work.

Setup

1. Prepare a large whiteboard or cover a wall with flip chart paper.
2. Arrange sticky notes and markers within easy reach of participants.

Instructional Steps

1. **Introduction (10 minutes)**
   - Explain that SSM is for exploring unclear or contested situations.
   - Define the situation: What are we trying to understand? Where is the confusion or concern? What's going on, who's involved, and what's unclear?
   - Keep it open; the goal is to frame the situation, not solve it.
2. **Express the situation (15 minutes)**
   - Revisit Rich Pictures (to map people, processes, tensions, and concerns).
   - The aim is to show how the situation looks; no analysis or solutions yet.
3. **Formulate root definition (10 minutes)**
   - Revisit CATWOE and use the written *Root Definition.*
   - Keep the definition focused on who does what, for whom, and why.
4. **Build conceptual models (25 minutes)**
   - List, e.g., five essential activities the system would need to carry out.
   - Arrange them in logical order – what must happen and in what sequence.
   - Keep it abstract; this is a conceptual model, not a process map.
5. **Compare with the real world (5 minutes)**
   - Look back at the Rich Picture or group discussion.
   - Ask: What's already happening or missing? What doesn't match? Let the group notice gaps, tensions, or contradictions.
6. **Define feasible and desirable change (15 minutes)**
   - As a group, ask: What could be improved? What would work in this setting?
   - Focus on changes that make sense, could be accepted, and would help.
7. **Consider action (15 minutes)**
   - Identify next steps, even small ones – conversations, pilots, process changes.
   - Record who will lead or support those steps.
8. **Debriefing (15 minutes)**
   - Emphasize that shared understanding is already progress.
   - Invite each person to share a key insight or next question.

Tips for Facilitators

Encourage participants to welcome different perspectives rather than rushing to agreement. Treat each Root Definition as a valid view of the system, even if unfamiliar. Focus on learning, not solutions. When building models, remind them to describe what must happen, not how. Let tensions and surprises emerge naturally during comparison. Stay grounded in real experience but open to alternative views.

Tips for Debriefing

Use the debrief to connect insights back to real-world challenges. Ask questions such as the following:

- What perspectives or assumptions were challenged in this process?
- How did the Root Definitions shape what you focused on?
- What stood out in the comparison between model and reality?
- What would you now do differently in your work or context?

Help the group reflect on how thinking in systems, rather than linear problems, shifted their understanding. Emphasize that clarity, dialogue, and shared understanding are useful outcomes in themselves.

Variations

SSM is flexible and can be adapted to many settings:

- *Multiple worldviews:* Have different stakeholder groups create their own Root Definitions and models, then compare them in one session.
- *SSM over time:* Use the process across several sessions, with reflection and updates between steps.
- *Paired method:* Combine SSM with other approaches (e.g., SWOT, Theory of Change) to deepen systems awareness during planning or review.
- *Visual templates:* Use printed CATWOE and Conceptual Model templates to speed up the process for first-time users or mixed groups.

Note

SSM is an advanced methodology. This summary offers a practical version of SSM for facilitators. For a full explanation of the original theory and development of the methodology, readers are encouraged to consult the foundational work of *Checkland [32].*

Viable System Model (VSM)

Perspectives | Interconnectedness | Boundaries | Feedback Loops | Delays

Purpose

The Viable System Model (VSM), developed by Stafford Beer [61], helps organizations spot gaps, overloads, or misalignments in structure and shows how they maintain and adapt. It focuses on five core system functions – Operations, Coordination, Control, Intelligence, and Governance – needed for long-term viability.

How It Works

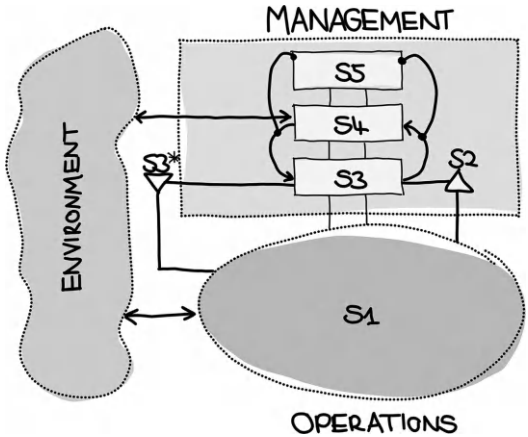
VSM maps one organizational unit at a time. Participants locate who performs each of the five essential functions:

- *System 1: Operations* – Who delivers the core work?
- *System 2: Coordination* – How is work coordinated and conflicts avoided?
- *System 3: Control* – Who manages performance and resources?
- *System 3*: Audit* – Who checks whether what's reported is actually true?
- *System 4: Intelligence* – Who looks outside and figures out what's coming?
- *System 5: Policy* – Who sets identity, policy, and long-term direction?

Multiple unit maps can later be combined to analyse the full organization.

Applications

VSM is used in organizational design, restructuring, leadership development, and systemic diagnosis. It's especially useful when coordination breaks down, management is overloaded, or roles are unclear.



Exercise: "Viable System Model"

Participants	Time	Equipment
3–7	75–90 minutes per unit	Large sheets of paper, markers, coloured pencils

Space: A room with enough space for each unit team to map their system.

Setup

1. Pick the unit to map and write its purpose (e.g., "Sales – Sell to clients").
2. Invite people from that unit to join the session (3–7 is ideal).
3. Use a blank sheet. Don't pre-label it. Use the VSM layout (see earlier) only for inspiration. Draw what actually happens, not how it "should" look like.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the goal: map how the unit stays viable.
   - Emphasize that this is about real work processes, not job titles.
2. **Mapping the systems (40–50 minutes)**
   - Guide participants through each system function one at a time. For each, ask the question and map the actual roles, people, and processes involved.
     i. *S1: Operations* – Who delivers the core work?
     → List 2–5 main activities. Write each in a circle or box.
     ii. *S2: Coordination* – How is work coordinated and conflicts avoided?
     → Add any routines, tools, or people that help coordinate S1 activities.
     iii. *S3: Control* – Who manages performance and resources?
     → Add those who set priorities, allocate resources, or manage delivery.
     iv. *S3*: Audit* – Who checks whether what's reported is actually true?
     → Add informal checks, surprise visits, direct reporting.
     v. *S4: Intelligence* – Who looks outside and figures out what's coming?
     → Add people or processes scanning trends, clients, competitors, etc.
     vi. *S5: Policy* – Who sets identity, policy, and long-term direction?
     → Add those who set values, goals or long-term trade-offs.
3. **Identify gaps and overloads (15 minutes)**
   - Review: Are any functions missing? Are some overloaded? Is coordination functioning? Is external sensing (S4) active? Mark weak points directly.
4. **Draw connections (10 minutes)**
   - Use arrows to show flows: coordination (S1↔S2); performance/resources (S1↔S3); planning (S3↔S4); policy/strategy (S4↔S5).
5. **Debriefing (15 minutes)**
   - Ask participants to reflect on what they discovered while mapping.
   - Encourage discussion of unexpected gaps or overloaded areas.

Tips for Facilitators

Encourage participants to focus on real work processes rather than formal structures or job titles. Guide them through each system with clear, simple questions. Allow space for reflection when uncertainty appears, as missing or overloaded functions are important findings. Keep discussions focused on one unit at a time. While drawing connections, clarify flows and ensure shared understanding. Support open dialogue with focus on system viability and actionable insights.

Tips for Debriefing

Create a positive, reflective environment where participants can openly share insights and concerns. Use questions such as the following:

- Which functions were clearly identified?
- Were any functions missing or unclear?
- Where did coordination seem weak or overloaded?
- Is external monitoring (S4) active and effective?
- Are long-term policy and identity (S5) clearly defined?
- How do these findings translate into practical improvements?

Summarize the main findings, highlighting patterns and key areas for follow-up. Encourage participants to connect insights to ongoing organizational challenges and to identify next steps for improvement.

Variations

Viable System Model mapping can be adapted to different group sizes and situations:

- *Multi-unit mapping:* Conduct separate mappings for multiple organizational units, then integrate for a full system view.
- *Recursive levels:* Apply the method at different organizational levels (team, department, enterprise).
- *Future-state mapping:* Map both current operations and potential future designs to explore system adaptability.
- *Progressive updates:* Revisit the maps periodically to reflect changes in structure, environment, or strategy.

Note

VSM is a technically rich framework rooted in management cybernetics. This method presents a simplified version for practical use in facilitation and group analysis. For more theory and its development, see the foundational work of Stafford Beer, Patrick Hoverstadt, and Michael Frahm [61, 62, 98].

Make

Take Action and Create Solutions

Once a system is seen more clearly, the next step is action. That doesn't mean applying fixed solutions but testing, observing, and adjusting based on how the system responds.

This chapter focuses on practical methods for intervening with care. In dynamic systems, action is not one move; it's a process. These tools support experiments, short loops of action and feedback, and the ability to adapt quickly when needed.

Complex systems are shaped by interdependence, feedback, delays, and nonlinearity. Small moves can ripple outward. That's why effective interventions are scoped clearly, designed to surface feedback, and open to revision.

Methods in this section help with the following:

- Testing small-scale interventions
- Finding constraints and leverage points
- Making decisions under uncertainty
- Engaging people in collaborative implementation
- Tracking both intended and unintended effects

Some methods are fast: try, see, adapt. Others provide structure: planning backwards from a goal, or mapping effects before acting. Some are creative: breaking patterns or combining unexpected ideas. What they share is this: in complex systems, doing is also a way of seeing.

Every intervention creates feedback. That feedback guides what to continue, change, or stop. Action must be visible, responsive, and shared. That means defining success, watching side effects, and building learning into the process – not after the fact but as part of it.

These tools assume change is collective. Sustainable impact depends on coordination, shared insight, and reflection. Without short feedback loops, action becomes chaotic, or performative. These methods help teams stay focused, flexible, and learning while doing.

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Not every idea needs to scale. Sometimes progress is a pilot, a policy test, or simply making a key choice visible. But it must shift how the system behaves, not just the conversation. Action isn't the end of thinking. It's one of the ways we learn: through feedback, reflection, and adjustment.

Human Knot

Interconnectedness | Feedback Loops | Perspectives

Purpose

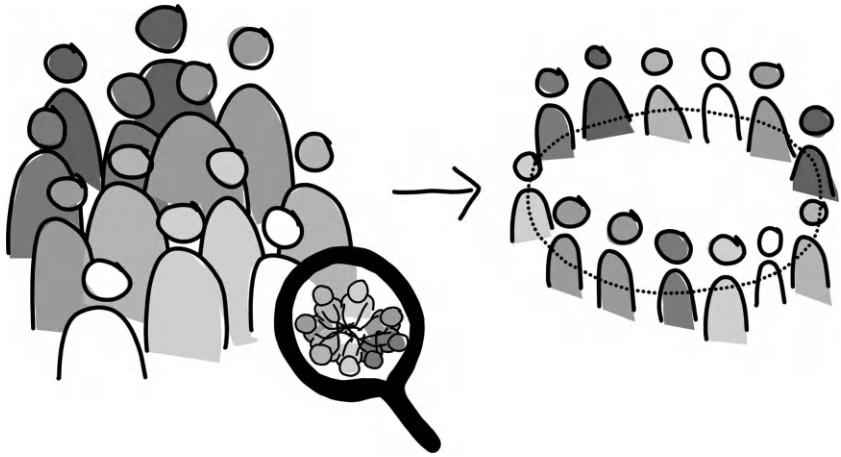
The Human Knot activity fosters teamwork, communication, and problem-solving by challenging participants to work together to untangle a physical puzzle without breaking their grip. This activity highlights the importance of collaboration, patience, and creative thinking.

How It Works

Participants stand in a circle, holding hands with two different people across from them, creating a "knot." The group then works together to untangle themselves back into a single circle without letting go of each other's hands.

Applications

This activity is effective in team-building settings, including workshops, retreats, and orientation sessions. It serves as an engaging way for participants to build trust, practice collaboration, and improve communication in a fun, interactive environment.



Exercise: "Human Knot"

Participants	Time	Equipment
8–20	15–30 minutes	None required

Space **:** An open area where participants have room to move comfortably.

Setup

1. Arrange the group in a circle with enough space to move without obstacles.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the objective: to untangle the knot without releasing hands.
   - Emphasize the role of teamwork, clear communication, and patience.
2. **Form the knot (5 minutes)**
   - Ask participants to reach out with their right hand and grab the hand of someone who is not directly next to them.
   - Repeat with the left hand, holding a different person's hand, again not adjacent.
3. **Start untangling (15–20 minutes)**
   - Instruct participants to begin untangling themselves without letting go.
   - Encourage verbal communication and collective problem-solving.
   - Allow them to move over, under, or around each other as needed.
4. **Facilitate as needed**
   - Observe how the group approaches the task.
   - If they struggle, encourage them to pause, communicate, and re-evaluate their positions.
5. **Celebrate success (5 minutes)**
   - Once the group successfully untangles into a circle, celebrate their teamwork and achievement with a round of applause or high-fives!
6. **Debriefing (15 minutes)**
   - Reflect on how the activity required teamwork and communication.
   - Ask participants to consider how these skills impacted their ability to solve the puzzle and how they might apply similar strategies in real-world situations.

Tips for Facilitators

Encourage active, balanced participation. Set expectations clearly: this is a shared challenge, not a race. Remind participants to communicate openly, move carefully, and stay patient. Observe how decisions are made – who leads, who supports, who hesitates. Step in only when needed to help the group pause, reassess, or shift strategy. Focus on collaboration, not speed. Ensure physical safety and allow for a reset if needed.

Tips for Debriefing

Create a calm, reflective space once the knot has been untangled or the attempt is complete. Invite participants to share what they noticed – not just about the outcome but about how the group functioned during the activity. Focus on communication, leadership, group decision-making, frustration tolerance, and adaptability. Use guiding questions such as the following:

- What strategies helped the group work through the knot?
- When did the group communicate well – and when not?
- Were any roles (leader, mediator, observer) taken on, intentionally or not?
- What moments of tension or breakthrough stood out?
- How do these dynamics show up in your usual work or team environment?

Summarize insights by highlighting how physical group problem-solving can mirror cognitive and emotional challenges in real-world collaboration. Emphasize that the activity was not just a puzzle but a mirror for team habits – helpful and unhelpful. If relevant, ask participants to identify one skill they'd like to carry into future group work.

Variations

The Human Knot activity can be adapted for different needs and group sizes:

- *Silent knot:* Challenge participants to complete the untangling without speaking, highlighting non-verbal communication.
- *Blindfolded knot:* For advanced groups, have one or more participants wear blindfolds, increasing the need for guidance and cooperation among teammates.
- *Time-limited knot:* Introduce a time constraint to test how the group balances speed with clarity and coordination under pressure.
- *Debrief-first replay:* After the first attempt and debriefing, allow the group to try again immediately with their new insights. Observe how their dynamics shift in a second round.

Paper Airplane Factory

Feedback Loops | Leverage Points | Emergence

Purpose

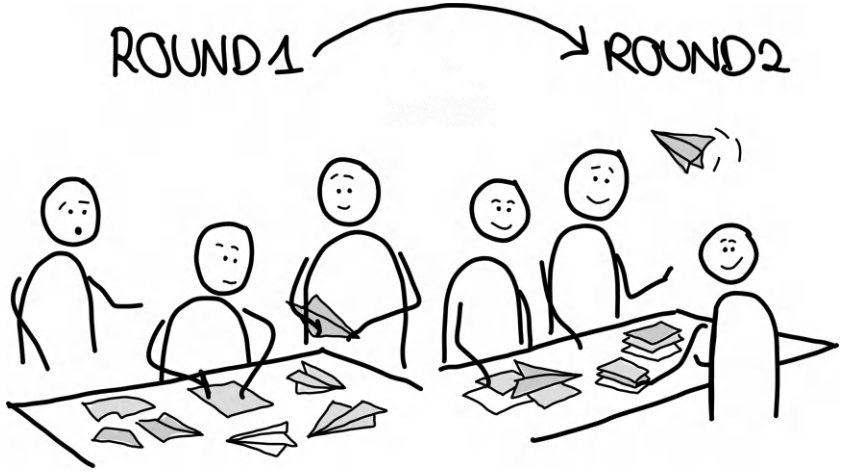
The Paper Airplane Factory activity is designed to engage participants in a hands-on manufacturing simulation. It illustrates key principles of process optimization, feedback loops, and teamwork as participants refine their workflow over multiple rounds to improve production and quality.

How It Works

Participants work in teams to produce paper aeroplanes, focusing on maximizing both quality and quantity. Through rounds of production, reflection, and process adjustments, teams learn how small changes and feedback can significantly enhance performance.

Applications

This exercise is ideal for teaching manufacturing principles, team-building, and systems thinking in settings like business training, project management, and education. It emphasizes adaptability and incremental improvement in a dynamic work environment.



Exercise: "Paper Airplane Factory"

Participants	Time	Equipment
4–10 per team, with multiple teams competing	35–45 minutes	Blank sheets of paper, scissors, timer

Space: An open room with enough space for teams to work comfortably.

Setup

1. Set up materials at each table.
2. Give each group enough paper to build several planes.
3. If possible, set up a flight area to test flight performance

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that this is a production simulation focused on speed, quality, and teamwork.
   - Emphasize the role of feedback loops and continuous improvement.
2. **Team formation (2 minutes)**
   - Divide participants into teams of 4–5 members each.
   - Optionally let them assign specific roles within each team (e.g., folder, quality control).
3. **Initial production round (10 minutes)**
   - Teams produce as many paper aeroplanes as possible within a set time (following a designated design).
   - Emphasize that only aeroplanes that meet certain criteria (e.g., can fly straight, certain distance, arrive at a certain destination) will count.
4. **Debrief after round 1 (10 minutes)**
   - Gather teams to discuss results and initial challenges.
   - Identify bottlenecks and strategies each team used.
5. **Process optimization (10 minutes)**
   - Teams brainstorm ways to improve their workflow, considering role specialization and bottlenecks.
   - Encourage creativity and efficiency in redesigning the process.
6. **Second production round (10 Minutes)**
   - Teams implement their improvements and produce aeroplanes.
   - Monitor and encourage communication to ensure effective collaboration.
7. **Debriefing (15 minutes)**
   - Reflect on how feedback loops and adjustments influenced the production.
   - Discuss what worked well and what could be improved

Tips for Facilitators

Be clear about design requirements so all teams aim for the same goal. Watch how roles form; don't assign them unless needed, and let teams self-organize if possible. During the redesign phase, encourage bold changes, even if they might not work. Capture examples of teamwork, decision-making, and performance shifts to use during the final debrief.

Tips for Debriefing

Keep the focus on learning, not winning. Ask teams to talk through their changes and how those played out. Use these questions to guide the discussion:

- What specific changes improved your process?
- Where did bottlenecks show up, and how did you handle them?
- Did your communication style shift between rounds?
- How did you balance speed with quality?
- What surprised you during the second round?
- How do these lessons apply to real work situations?

Wrap up by connecting the activity to larger systems: how feedback, clarity, and small adjustments lead to big differences. Ask teams to identify one practice they'd try in their own workflows.

Variations

- *Flight challenge*: Set different criteria for "quality," such as requiring planes to fly in circles or hit a target, to simulate evolving production standards.
- *Time-limited rounds*: Reduce time for each round to test adaptability under pressure.
- *Focus on quality*: Introduce a round with stricter quality standards, emphasizing precision and detail.
- *Surprise rule change:* After round 1, change the design criteria to simulate a shift in client needs or market demand.
- *Remote adaptation*: For virtual settings, use an online timer and have each team produce and test aeroplanes independently before sharing results.

Forced Prioritization

Leverage Points | Boundaries | Perspectives

Purpose

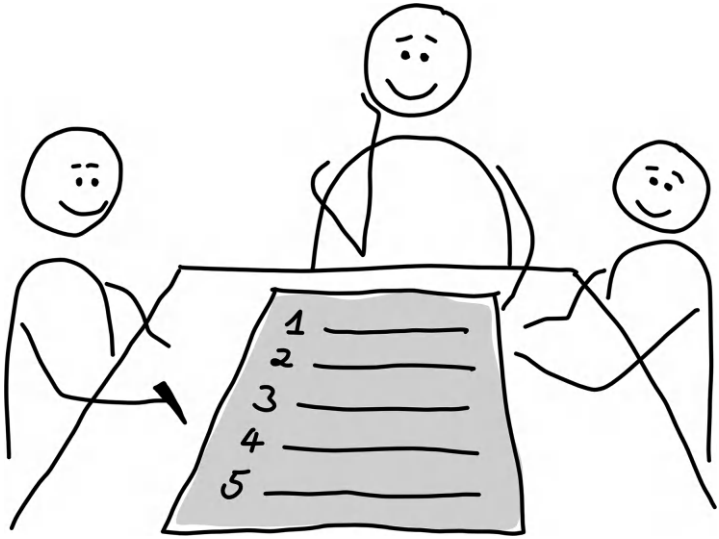
Forced Prioritization is an exercise that helps teams make tough decisions when resources are limited and time is short. By requiring participants to rank items without ties, it reveals underlying values, assumptions, and trade-offs – fostering clarity and alignment.

How It Works

Participants are presented with a list of items – such as projects, features, or initiatives – and are required to rank them in order of importance based on a specific criterion. No two items can share the same rank, forcing deliberate choices and discussions about priorities.

Applications

This method is particularly useful in scenarios where teams face resource constraints, tight deadlines, or conflicting priorities. It's applicable in strategic planning, product development, and any context where clear prioritization is essential.



Exercise: "Forced Prioritization"

Participants	**Time**	**Equipment**
4–10	30–60 minutes	List of items, ranking sheets or cards, pens

Space **:** A room with tables and chairs for group discussion.

Setup

1. Prepare a list of 10–15 items relevant to the team's context.
2. Provide each participant with a ranking sheet or set of numbered cards.
3. Arrange seating to facilitate open discussion.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of the exercise: to prioritize items without assigning equal rankings.
   - Emphasize the importance of honest discussion and consensus.
2. **Individual ranking (5 minutes)**
   - Ask each participant to rank the items individually, assigning a unique rank to each.
3. **Group Discussion (15–20 minutes)**
   - Facilitate a group discussion to compare individual rankings.
   - Encourage participants to explain their reasoning and negotiate a collective ranking.
4. **Finalization (5–10 minutes)**
   - Agree on a final group ranking of the items.
   - Document the final prioritized list for reference.
5. **Debriefing (15 minutes)**
   - Reflect on the decision-making process and the challenges encountered.
   - Discuss how the exercise influenced participants' understanding of priorities and trade-offs.

Tips for Facilitators

Set the tone early: the goal is clarity, not winning. Encourage participants to explain their reasoning, listen to others, and stay flexible. Make sure everyone contributes – especially quieter voices. Watch for dominant speakers and gently balance the group. Remind participants that trade-offs are part of the process, not a sign of failure. Step in only when the discussion gets stuck or off track. Help the group stay focused on the bigger picture.

Tips for Debriefing

Once the ranking is done, shift to reflection. Ask the group to think about how they made their choices – not just what was ranked where. Focus on the process: what influenced decisions, where disagreements happened, and how they were resolved.

Use questions like the following:

- What criteria did you rely on most when ranking?
- Which items caused the most debate? Why?
- Did any personal values or assumptions come up?
- How did the group handle disagreement?
- What trade-offs felt uncomfortable?
- What would you do differently next time?

Summarize the discussion by highlighting how the exercise revealed real-world patterns in decision-making, communication, and values. Encourage the group to carry one key insight or agreement into their next planning session or project.

Variations

Forced Prioritization can be adapted to match different settings and group needs:

- *Time pressure:* Give the group only 5–10 minutes to decide. This forces quick thinking and shows how pressure changes decision-making.
- *Anonymous ranking:* Have everyone rank in private, then reveal and compare results. This can reduce bias and surface honest views.
- *Different criteria:* Run two rounds using different priorities (e.g., impact vs. ease) and compare the results.
- *Remote version:* Use shared documents or polling tools to do the ranking online. Works well for distributed teams.
- *Role-based ranking:* Ask each person to rank from a different stakeholder perspective (e.g., customer, manager, frontline staff). This helps expand the view.

Resource Tree

Boundaries | Dependencies | Leverage Points

Purpose

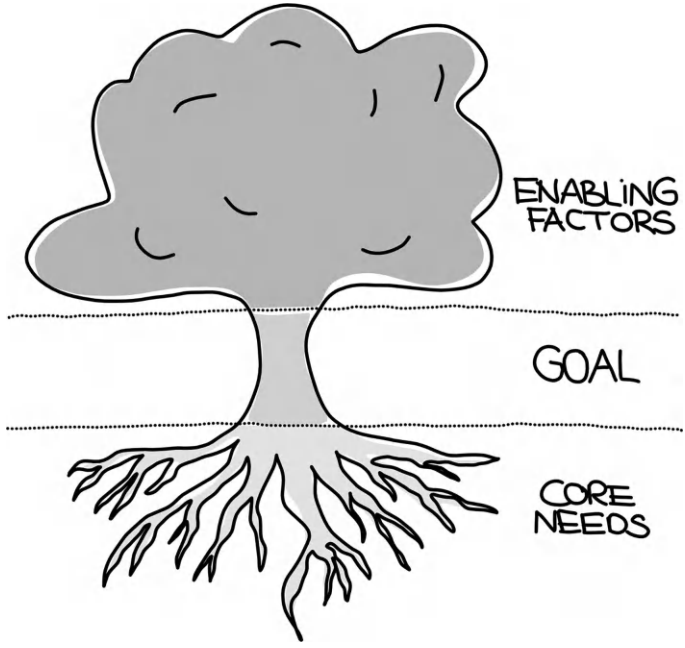
The Resource Tree helps teams understand what is needed to make a planned action possible. It clarifies dependencies between resources and highlights which elements are essential, optional, missing, or blocked. This structure supports more grounded decision-making when translating ideas into practical steps.

How It Works

Participants begin with a desired action or outcome and break it down into the resources required to make it happen. These are mapped visually in a tree format, showing which inputs depend on others. The process helps identify bottlenecks, assess feasibility, and guide next steps.

Applications

Useful in planning, prototyping, or prioritization sessions – especially where resources are limited or uncertain. It supports product development, change initiatives, innovation sprints, and collaborative decision-making under constraint.



Exercise: "Resource Tree"

Participants	Time	Equipment
5–15	45–60 minutes	Large paper or whiteboard, markers, sticky notes

Space: Tables or wall space for drawing and discussion.

Setup

1. Prepare a large surface with a simple tree outline: trunk in the middle, root space below, branches/leaves above.
2. Give each participant sticky notes and markers.
3. Define a clear desired outcome or initiative to work toward.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the exercise will map what's needed to reach a goal.
   - Highlight the tree structure: trunk (goal), roots (needs), leaves (enablers).
2. **Define the goal (10 minutes)**
   - Write the main goal in the centre of the page as the trunk.
   - Ensure all participants agree on the shared outcome.
3. **Identify resources (10 minutes)**
   - Ask: "What do we need to achieve this?"
   - Capture all inputs on sticky notes – people, tools, access, funding, etc.
4. **Build the tree (10–15 minutes)**
   - Place the *goal* in the trunk.
   - Add *core needs* as roots below the trunk.
   - Add *enabling factors* as leaves or branches above.
   - Draw arrows to show links and dependencies.
5. **Assess constraints (10 minutes)**
   - Mark each resource as follows: "✓" Available, "-" Missing, "?" Uncertain.
   - Note key bottlenecks or fragile links.
6. **Explore options (10 minutes)**
   - Discuss what can move forward now and where gaps need solving.
   - Identify quick wins, critical gaps, and possible alternatives.
7. **Debriefing (15 minutes)**
   - Reflect on what the tree revealed – surprises, risks, assumptions.
   - Ask: What's realistic? What's blocked? What's the next step?

Tips for Facilitators

Keep the group grounded in the goal. The tree isn't about listing everything; it's about identifying what's essential to act. Watch for over-detailing or drifting off-topic. Use the visual structure to keep focus: roots = needs, trunk = goal, branches/leaves = enablers. Check for balance; encourage quieter voices to speak, and manage dominant ones. Support participants in spotting gaps and dependencies without rushing to solve everything. Pause to summarize key patterns as they emerge.

Tips for Debriefing

Shift from listing to reflection. Ask how the structure changed their thinking. Help the group notice what surprised them – what was missing, assumed, or unclear. Highlight how visibility of constraints can shift priorities. Use questions like the following:

- What stood out once everything was mapped?
- Were any resources more fragile or uncertain than expected?
- What assumptions got challenged?
- Where are the biggest risks or bottlenecks?
- What's one thing that feels doable now?

Wrap up by asking participants to name a clear next step – individually or as a team.

Variations

The Resource Tree can be adapted in several ways:

- *Quick tree:* Focus only on top 3–5 core needs for fast planning.
- *Reverse tree:* Start with existing resources and ask, "What can we achieve with this?"
- *Stakeholder view:* Have different groups map the tree from their perspective (e.g., funder, user, delivery team).
- *Time-phased tree:* Mark each resource as Now/Soon/Later to plan over time.
- *Digital version:* Use shared whiteboards (e.g., Miro, Jamboard) for remote or hybrid teams.

Kano Model

Perspectives | Leverage Points | Boundaries

Purpose

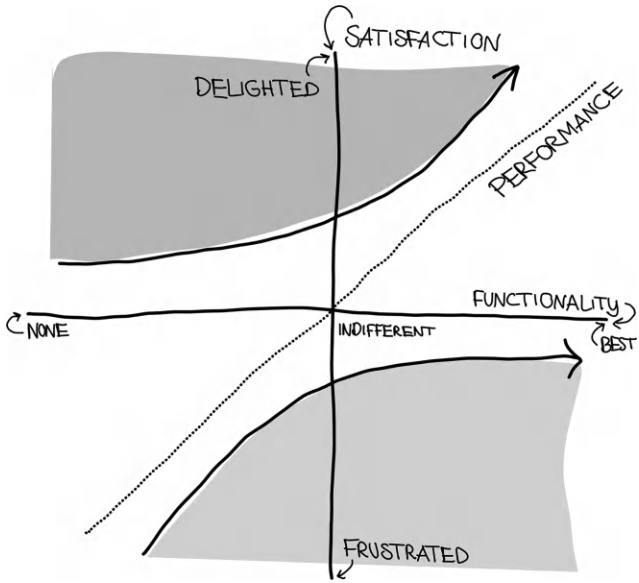
The Kano Model, developed by Professor Noriaki Kano in 1984, helps teams focus on what matters most to users. It sorts features into categories based on how they affect satisfaction, what users expect, what they appreciate, and what delights them. This helps teams decide which features to prioritize so they can spend time and resources on those that make the biggest impact.

How It Works

Participants review a list of product features and place each one into one of five categories: must-haves, performance features, delighters, indifferent, or reverse. By mapping these on a satisfaction-impact grid, teams can see which features are essential, which can give them a competitive edge, and which might not be worth the effort.

Applications

This activity works well in product development, service design, and customer experience projects. It helps teams avoid waste, find high-impact features, and make sure what they build truly meets user needs.



Exercise: "Kano Model"

Participants	**Time**	**Equipment**
6–15	1.5–2 hours	Large sheets of paper, markers, sticky notes

Space : A room with enough wall or board space to display the Kano grid.

Setup

1. Provide each team with sticky notes, markers, and a large sheet of paper.
2. Make sure there's enough space for teams to move around and work together comfortably.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the goal of the exercise: to prioritize features based on user impact using the Kano Model categories.
2. **List of Features (15 minutes)**
   - Ask participants to write down relevant features – one per sticky note.
   - Focus on real or likely features for your product or service.
3. **Categorize Features (30 minutes)**
   - Each team writes the five Kano categories (see later) on sticky notes or paper and places them as headers on the table or wall.
   - As they review each feature, they decide which category it belongs to and place the sticky note underneath.
   - Use these categories:
     i. *Must-have*: Required features that prevent dissatisfaction.
     ii. *Performance*: Features that increase satisfaction as they improve.
     iii. *Delighters*: Features that provide unexpected pleasure if present.
     iv. *Indifferent*: Features that don't significantly impact satisfaction.
     v. *Reverse*: Features that could reduce satisfaction (not in the graph).
4. **Create Kano Grid (5 minutes)**
   - Instruct them to draw a simple 2 × 2–style grid on a large piece of paper:
     i. Horizontal axis: Implementation Effort
     ii. Vertical axis: Customer Satisfaction
5. **Plot Features on Grid (15 minutes)**
   - Arrange features on the grid according to their satisfaction impact, and discuss their potential importance.
6. **Debriefing (15 minutes)**
   - Reflect on how features were categorized, and discuss insights on product focus areas and potential delighters.

Tips for Facilitators

Encourage teams to think from the user's point of view, not just their own. Make sure the categories are clearly understood before sorting begins. Watch for bias; people often overrate features they've worked on or feel attached to. Keep the pace steady, but allow time for real discussion. If the group gets stuck, remind them that not everything can be a must-have. Use gentle prompts to push critical thinking and honest prioritization.

Tips for Debriefing

Create space for teams to reflect on how they made their decisions. Focus on what stood out or surprised them – especially around delighters or reverse features. Ask what changed during the discussion and why.

Use guiding questions such as the following:

- Which features created the most discussion or disagreement?
- Did your view of any feature change during the process?
- How might your users see this differently than you do?
- What would you do next based on this exercise?

Wrap up by highlighting how simple tools like this can lead to clearer priorities, fewer assumptions, and stronger alignment with user needs.

Variations

- *User segment analysis*: Conduct separate sessions for distinct user groups to capture unique needs.
- *Timed categorization*: Set a strict timer per feature to maintain focus and decision-making pace.
- *Re-ranking:* After initial sorting and grid placement, revisit the list and allow one round of changes.
- *Digital version:* Use digital whiteboards for remote or hybrid teams.
- *Customer view:* Bring in actual customer input – live or via quotes – to inform feature placement.

Note

The Kano Model became widely used in product development, UX, and quality management to prioritize features based on their impact on customer satisfaction. Multiple variations and refinements have been studied to address details in classification and application [99].

Theory of Constraints (TOC)

Leverage Points | Feedback Loops | Delays | Boundaries | Perspectives

Purpose

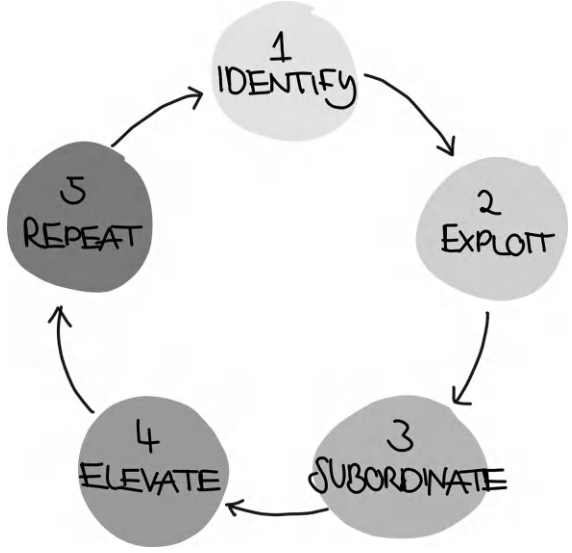
The Theory of Constraints, developed by Eliyahu Goldratt [100], helps participants identify and reduce system bottlenecks by focusing attention on the most limiting factor in a process. By targeting constraints directly, this method supports practical improvements with measurable system-wide impact.

How It Works

Participants map a system or process, identify the current constraint, and apply TOC's five focusing steps: Identify, Exploit, Subordinate, Elevate, and Repeat. The group develops targeted improvements, tests ideas, and reflects on how resolving one constraint may shift pressure elsewhere.

Applications

TOC is used in process optimization, project management, production, and any environment where flow and throughput matter. It helps groups focus on leverage points, avoid scattered fixes, and build a habit of continuous improvement grounded in system behaviour.



Exercise: "Theory of Constraints (TOC)"

Participants	**Time**	**Equipment**
6–15 (divide larger groups into subgroups)	2−2.5 hours	Large paper, markers, sticky notes

Space **:** A room with enough space for mapping, group work, and discussion.

Setup

1. Provide materials for each team: paper, markers, sticky notes.
2. Ensure enough space for process mapping and group discussion.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the Theory of Constraints and the concept of system bottlenecks.
   - Outline the TOC steps: Identify, Exploit, Subordinate, Elevate, Repeat.
2. **System mapping (20 minutes)**
   - Guide participants in mapping a system or process (e. g. Cluster Map).
   - Identify the main components and relationships within the system.
3. **Identify constraints (20 minutes)**
   - Brainstorm potential bottlenecks and pinpoint the primary constraint(s).
   - Mark constraints on the map, using data and experience to back choices.
4. **Analyse constraints (20 minutes)**
   - For each constraint, discuss its impact and severity within the system.
5. **Exploit the constraints (20 minutes)**
   - Brainstorm low-cost, practical ways to get more from the constraint without major changes. Focus on "quick wins."
6. **Subordinate supporting processes (10 minutes)**
   - Adjust supporting processes so they align with the pace of the constraint.
7. **Elevate the constraint (20 minutes)**
   - If needed, discuss bigger changes to remove the constraint (e.g., investment, redesign). This may involve investment, structural change, or redesign.
8. **Repeat the process (15 minutes)**
   - Check if the constraint has shifted and plan another round if needed.
9. **Action planning (15 minutes)**
   - Prioritize solutions, create an action plan, assign responsibilities, and set timelines for implementation.
10. **Debriefing (15 minutes)**
    - Reflect on the process and discuss how TOC can be applied to other systems or areas in the organization.

Tips for Facilitators

Encourage participants to identify constraints based on real experience or system behaviour, not assumptions. Guide the group to stay focused on one constraint at a time and resist jumping to general fixes. During the Exploit and Elevate steps, help participants stay grounded in actions that are both realistic and testable. Emphasize that small, targeted changes can have system-wide effects. Use the system map to keep the conversation visual and structured; mark changes directly as they are proposed. Reinforce the idea of iteration: one solved constraint often reveals the next.

Tips for Debriefing

Create a space for reflecting on both the system and the group's thinking.

Use questions such as the following:

- What helped you identify the constraint?
- How did focusing on one point shift the way you saw the system?
- What challenges came up when trying to priorities?
- Which actions felt immediately useful – and which ones didn't?
- What surprised you about how the system responded?
- How might you apply this method in other areas or teams?

Summarize the key shifts in focus or clarity. Emphasize how a constraint-based approach can improve prioritization, reduce overload, and support continuous improvement. Invite participants to reflect on how this framing might support real decision-making or planning.

Variations

Theory of Constraints can be adapted to fit different settings and goals:

- *Quick TOC:* For short sessions, focus only on identifying the constraint and brainstorming quick, low-cost improvements.
- *Layered mapping:* For complex systems, start by mapping subsystems, then integrate them to identify the core constraint.
- *Data-driven TOC:* Incorporate key metrics or KPIs into the analysis to support evidence-based constraint identification.
- *Team-specific maps:* Run separate sessions for different teams or roles, then compare where each sees constraints and bottlenecks.
- *Live constraint tracking:* Use a visible board or tracker to revisit constraints over time; mark when one is resolved and identify the next.
- *Digital TOC:* Use collaborative whiteboard tools for remote or hybrid settings, allowing for live mapping and updates.

Prototyping Sprints

Leverage Points | Feedback Loops | Delays | Boundaries | Perspectives

Purpose

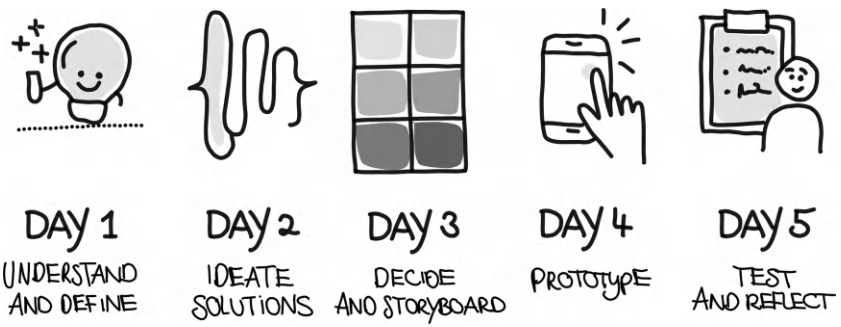
Prototyping Sprints enable teams to rapidly develop and test solutions to specific challenges. Adapted from the sprint method developed by Knapp, Zeratsky, and Kowitz [101], this approach compresses the design process into a short, focused timeframe. It allows teams to quickly validate ideas, gather user feedback, and iterate, reducing the risk of investing in untested concepts.

How It Works

Over a span of 4–5 days, cross-functional teams collaborate to understand a problem, ideate solutions, create a prototype, and test it with real users. This structured approach accelerates learning and decision-making, ensuring that only the most viable solutions move forward.

Applications

Ideal for product development, service design, and process improvement, Prototyping Sprints are especially useful when time is limited, stakes are high, and rapid validation is needed. They help teams align quickly, focus on user needs, and make informed decisions based on real feedback.



Exercise: "Prototyping Sprints"

Participants	**Time**	**Equipment**
5–7 (cross-functional team)	4–5 days	Whiteboard or digital collaboration tools, prototyping materials, user testing setup

Space **:** Collaborative workspace with breakout areas for team activities and user testing.

Setup

1. Form a team with a mix of roles and viewpoints. Ensure they're available full-time during the sprint.
2. Schedule 3–5 user or stakeholder interviews for Day 5. Prepare materials for sketching and low-fidelity prototyping.

Instructional Steps

1. **Understand and Define (Day 1)**
   - Start with a brief orientation: purpose, format, and expected outcomes.
   - Review system maps, leverage points, or constraints that led to this sprint.
   - Define the sprint challenge and key assumptions.
   - Clarify what success means in terms of learning, not output.
2. **Ideate Solutions (Day 2)**
   - Brainstorm a wide range of practical and bold ideas.
   - Sketch individually, then share and discuss as a group.
   - Cluster and compare concepts to surface patterns.
3. **Decide and Storyboard (Day 3)**
   - Select the most promising ideas and combine them if needed.
   - Create a clear storyboard that shows what will be tested.
   - Plan prototype materials and prepare for Day 4.
4. **Prototype (Day 4)**
   - Build a simple, low-fidelity prototype – just enough to test the idea.
   - Assign roles for facilitation and observation.
   - Run a short dry run to ensure clarity before testing.
5. **Test and Reflect (Day 5)**
   - Test with 3–5 users or stakeholders using a consistent approach.
   - Observe carefully – look for surprises, resistance, missed signals.
   - Debrief after each session and refine as needed.
   - Hold a structured team reflection to gather insights and next steps.

Tips for Facilitators

Support the team in staying focused and time-disciplined throughout the sprint. Encourage participants to treat this as a learning activity, not a performance. Help them connect their prototype to earlier system insights – especially leverage points, feedback loops, or assumptions surfaced during mapping. During testing, remind the team that they're observing how the system responds, not just collecting user opinions. Reinforce that even failed tests offer useful insight into system behaviour. Guide participants in distinguishing between noise, real signals, and signs of systemic resistance or opportunity.

Tips for Debriefing

Create space for a focused team debrief after testing. Use open questions such as the following:

- What feedback did we receive that challenged our assumptions?
- What surprised us during testing – positive or negative?
- Did our prototype affect the part of the system we hoped it would?
- What unintended effects or missing variables showed up?
- How might this test inform our next experiment or intervention?
- What's the smallest next step we could take to build on this?

Encourage the team to link their observations back to the larger system view. Focus on the sprint as a feedback mechanism that reveals structure, resistance, or leverage – not just user preference. Conclude with a written summary of lessons and options for iteration, pause, or scale.

Variations

Prototyping Sprints can be adapted to different formats, team capacities, or intervention scopes:

- *Mini Sprint:* Compress into 2–3 days to test a narrow question, single touchpoint, or surface-level response.
- *Focus Sprint:* Zoom in on one leverage point or constraint revealed in system mapping for targeted learning.
- *Rolling Sprint:* Use repeated sprints across different parts of a system to explore multiple intervention paths over time.
- *Remote Sprint:* Use digital whiteboards, video calls, and prototyping tools to run the full sprint virtually.

Note

Prototyping Sprints are an advanced methodology. This method adapts the sprint format [101]. The original format focused on start-ups and UX.

Process Hacking

Leverage Points | Feedback Loops | Delays | Boundaries | Perspectives

Purpose

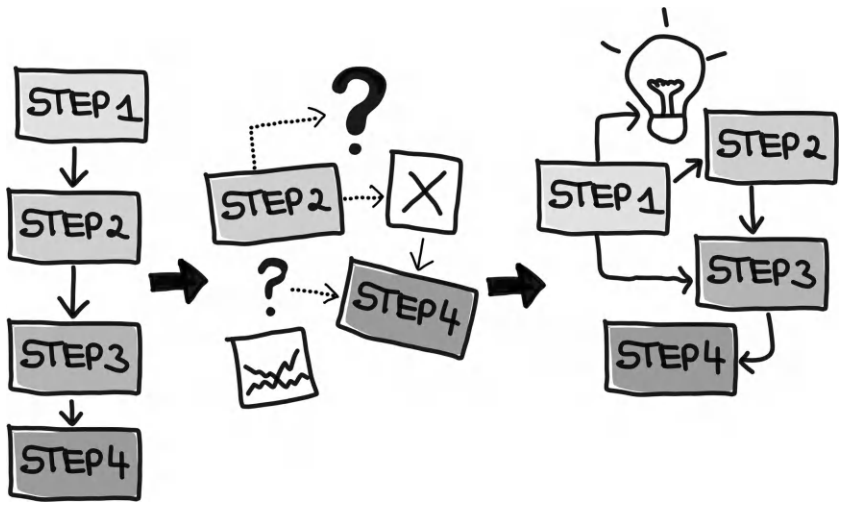
Process Hacking is a hands-on method that encourages teams to critically examine and improve existing processes. By intentionally "breaking" down current workflows, identifying inefficiencies, and collaboratively developing solutions, this approach fosters a culture of continuous improvement and systemic thinking.

How It Works

Participants dissect a current process to uncover hidden assumptions, bottlenecks, and inefficiencies. Through collaborative analysis, they identify areas for improvement and redesign the process to enhance effectiveness and adaptability.

Applications

This method is valuable in organizational development, service design, and operational efficiency projects. It's particularly useful when existing processes are outdated, overly complex, or misaligned with organizational goals.



Exercise: "Process Hacking"

Participants	Time	Equipment
4–10	2–3 hours	Whiteboard or large sheets of paper, markers, sticky notes

Space: A room with enough wall space for mapping processes and group discussion.

Setup

1. Select a process that is outdated, inefficient, or frustrating for those involved.
2. Prepare mapping materials and gather a group with first-hand experience of the process.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose: examining and improving an existing process.
   - Emphasize a non-blaming approach focused on system improvement, not individual performance.
2. **System mapping (20 minutes)**
   - Guide participants in mapping the current process (e. g. *Cluster Mapping*).
   - Use sticky notes to identify tasks, decisions, roles, and handoffs.
3. **Identify pain points (20 minutes)**
   - Highlight where delays, confusion, or errors occur.
   - Discuss where the process creates friction, waste, or unnecessary complexity.
4. **Break the process (30 minutes)**
   - Challenge each step: What happens if we remove or change it?
   - Identify hidden assumptions or habits that might be limiting better performance.
5. **Design improvements (30 minutes)**
   - Brainstorm possible fixes or simplifications.
   - Prioritize changes based on impact and feasibility.
   - Draft a new process map with the proposed improvements.
6. **Plan implementation (20 minutes)**
   - Assign responsibilities and set short-term actions.
   - Identify simple metrics or signals to track improvement.
7. **Debriefing (15 minutes)**
   - Reflect on what was learned about the process and system.
   - Discuss how breaking the process helped uncover deeper issues or opportunities.

Tips for Facilitators

Encourage participants to be honest but constructive. Set a clear tone from the beginning: the focus is on fixing the system, not assigning blame. Make sure all voices are heard – especially from those who deal with the process daily. Use clarifying questions to challenge assumptions or uncover invisible steps. Help the group stay focused on underlying causes, not just symptoms. Keep energy up during redesign by prioritizing simple, practical improvements over abstract ideas.

Tips for Debriefing

Create a reflective space where participants can share what they learned about the system, not just the process. Use guiding questions such as the following:

- What parts of the process were more fragile or complex than expected?
- What surprised you when steps were challenged or removed?
- What assumptions did we uncover or let go of?
- How could we use this approach in other parts of our work?
- What's one thing you'll do differently after this session?

Summarize key insights and link them back to broader system goals or constraints. Encourage follow-up sessions to check if the redesigned process is delivering better results.

Variations

Process Hacking can be adapted to different teams, formats, or timeframes:

- *Rapid hacking:* Run shorter sessions (30–60 minutes) focusing on one pain point or small process segment.
- *Cross-team hacking:* Involve participants from multiple functions to break silos and surface handoff issues.
- *Silent mapping:* Begin with a quiet mapping round before discussion – useful in hierarchical groups.
- *Live testing:* After redesign, run a small-scale trial immediately and collect live feedback.
- *Digital boards:* Use online whiteboards or process-mapping tools for remote or hybrid sessions.

Backcasting

Feedback Loops | Delays | Nonlinearity | Perspectives | Leverage Points

Purpose

Backcasting is a method introduced by John B. Robinson [102] that enables organizations and teams to create actionable strategies by imagining a desired future and then identifying the steps needed to achieve it, working from the goal backward to the present.

How It Works

Participants start by defining a clear future goal, then envision the steps needed to make it a reality. This approach moves backward from the outcome, mapping significant milestones and identifying obstacles. The result is a structured roadmap that promotes proactive, goal-oriented planning.

Applications

Backcasting is useful in settings focused on sustainability, organizational strategy, and long-term project management. It supports innovative thinking, planning beyond current limitations, and a systematic approach to tackling large, long-term goals.

Exercise: "Backcasting"

Participants	Time	Equipment
5–15	2–2.5 hours	Whiteboard or large paper, markers, sticky notes (optional)

Space : A collaborative room with wall space for displaying steps and visuals.

Setup

1. Prepare a large workspace with plenty of room for participants to move around and interact with the planning materials.
2. Gather markers, sticky notes, and a whiteboard or large paper for mapping steps.

Instructional Steps

1. **Introduction (2 minutes)**
   - Introduce participants to the concept of Backcasting, emphasizing its focus on working from a desired future rather than predicting based on current trends.
2. **Define goal (15 minutes)**
   - Facilitate a discussion to define a specific, desirable future goal.
   - Ensure the goal is clear, measurable, and inspiring, then write it at the top of the workspace.
3. **Envision the future (15 minutes)**
   - Encourage participants to visualize the successful outcome in detail.
   - Capture insights as bullet points or images around the goal.
4. **Work backwards (30 minutes)**
   - Begin at the goal and ask participants to define key milestones needed to reach it, working backward. Use questions such as the following:
     i. What must be completed before this step?
     ii. What conditions need to exist at each stage? Connect milestones to form a pathway.
5. **Spot challenges and barriers (20 minutes)**
   - Discuss potential obstacles at each step. Identify ways to overcome these challenges, and document them alongside the steps.
6. **Develop action plans (15 minutes)**
   - For each milestone, brainstorm the actions needed. Assign responsibilities and timelines, and consider resources and partnerships required.
7. **Debriefing (15 minutes)**
   - Facilitate a reflective discussion on the insights gained, highlighting unexpected outcomes and key consequences.

Tips for Facilitators

Set a goal that is ambitious yet achievable to keep participants motivated and focused on a meaningful outcome. Use clear visuals, such as flowcharts or diagrams, to help everyone see the connections between each step and milestone, which aids in understanding the broader plan. Foster an open, collaborative environment, encouraging participants to contribute ideas freely. Summarize insights at each stage to ensure clarity, and reinforce the link between each milestone. Remind participants that brainstorming should be open and without immediate judgment to encourage creative problem-solving.

Tips for Debriefing

Wrap up the session by guiding participants through reflective questions to highlight key takeaways and strengthen their commitment to the plan. Prompt them to think about aspects like the following:

- What unexpected insights did we gain?
- How has this approach shifted our thinking about long-term planning?
- Which challenges might complicate our path, and how can we address them?

These questions encourage participants to assess the plan's strengths and potential obstacles, preparing them for future planning stages.

Variations

- *Digital backcasting*: Use online platforms such as Miro or MURAL for virtual team collaboration, enabling remote participants to work together on real-time mapping.
- *Simplified backcasting*: For sessions with limited time, focus on identifying only the key milestones without going into detailed steps. This approach provides a high-level view of the pathway to the goal and can be built on later.

Synectics

Perspectives | Emergence | Nonlinearity | Boundaries

Purpose

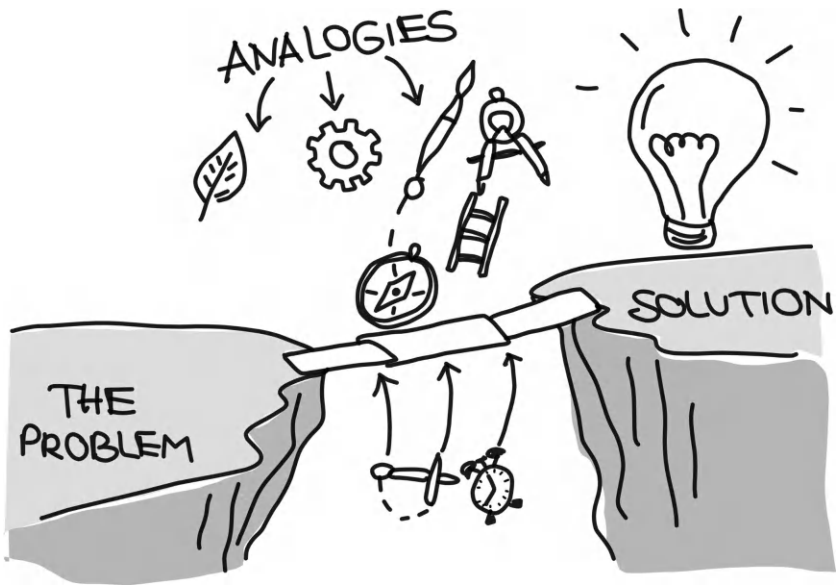
Synectics is a creative problem-solving technique developed by William J.J. Gordon and George M. Prince [103]. It helps spark innovation by drawing on analogies from unrelated fields. By connecting seemingly unrelated ideas, participants can uncover fresh solutions and break out of conventional thought patterns.

How It Works

Through analogy and metaphor, participants reframe problems by exploring concepts from other domains, such as nature, technology, and art. This process encourages participants to look at problems in a new way and develop innovative, often unconventional, solutions.

Applications

The Synectics method is useful in product development, strategic planning, marketing, and other fields that benefit from creative problem-solving. It promotes diverse thinking, collaboration, and a structured approach to generating unique ideas.



Exercise: "Synectics"

Participants	Time	Equipment
6–15	1.5–2 hours	Whiteboard or large sheets of paper, markers in various colours

Space : A room with a collaborative setup, preferably with a whiteboard and wall space to display analogies and solutions.

Setup

1. Arrange a workspace with enough room for participants to share ideas visually.
2. Prepare markers, sticky notes, and large paper or a whiteboard.

Instructional Steps

1. **Introduction (2 minutes)**
   - Introduce Synectics as a tool for creative thinking that uses analogies to uncover new ideas.
   - Explain that the process involves connecting unrelated concepts to gain fresh perspectives.
2. **Define the problem (5 minutes)**
   - Clearly state the problem or challenge, and write it prominently on the board or paper.
3. **Create analogies (10 minutes)**
   - Encourage participants to brainstorm analogies from different, unrelated fields, such as nature, technology, or art.
   - Write each analogy on a sticky note or directly on the board.
4. **Explore analogies in group (15 minutes)**
   - Divide participants into small groups, and assign each group a few analogies.
   - Each group discusses how their assigned analogies might reveal insights or solutions related to the problem.
5. **Generate and share solutions (30 minutes)**
   - Have each group create solutions inspired by their analogies.
   - Gather everyone back together, and let each group present their ideas.
6. **Debriefing (15 minutes)**
   - Facilitate a discussion on the feasibility and potential impact of each solution, and reflect on the insights gained, highlighting unexpected outcomes and key consequences.

Tips for Facilitators

Create an open-minded atmosphere where all ideas are welcome and free of judgment. Encourage participants to think broadly when coming up with analogies, reminding them that there are no wrong answers in creative exploration. Use visual aids, like diagrams or charts, to illustrate how analogies connect to potential solutions. Summarize key points during discussions to ensure participants understand the connections between ideas. Maintain an environment that fosters curiosity and innovative thinking by encouraging all voices to contribute equally.

Tips for Debriefing

Conclude the session by guiding participants through reflective questions to highlight lessons learned and identify valuable takeaways. Ask questions such as the following:

- What were the most surprising ideas or connections made?
- How did using analogies change our approach to the problem?
- Which solutions could be adapted for future challenges?

These reflections help participants recognize the benefits of analogical thinking, and prepare them to apply this method to future problem-solving scenarios.

Variations

- *Digital Synectics:* Utilize online collaboration tools for remote or hybrid sessions, allowing participants to brainstorm and map ideas in real time.
- *Quick Synectics:* In shorter sessions, focus on generating a handful of analogies and exploring just one or two in-depth. This approach speeds up the process while still fostering creative thinking.

Morphological Analysis

Perspectives | Interconnectedness | Emergence | Nonlinearity

Purpose

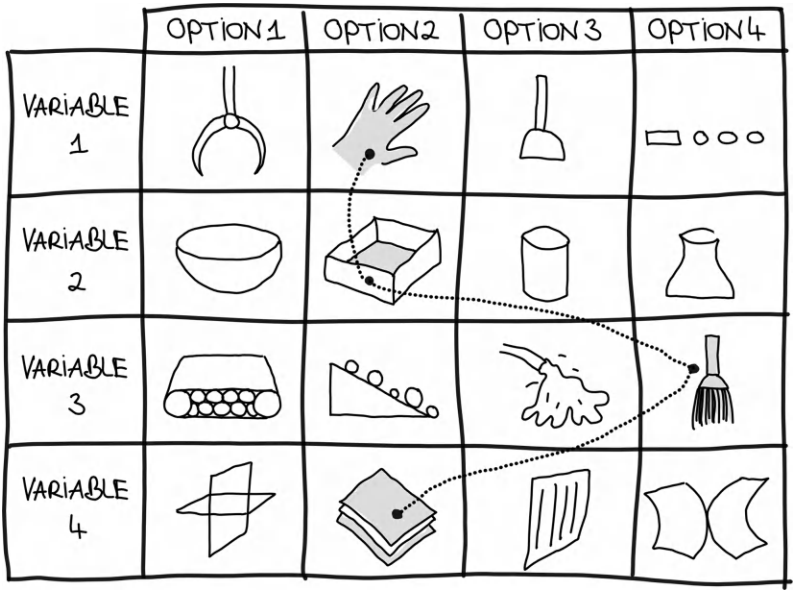
Morphological Analysis is a structured method for exploring complex problems by examining different combinations of key variables. Developed by Fritz Zwicky [51], it breaks a challenge into components and systematically tests how different configurations interact. This helps teams uncover novel solutions, especially when problems are too complex for linear or quantitative approaches.

How It Works

Participants define essential variables (plotted on the vertical axis) and explore combinations of possible options for each (plotted on the horizontal axis). This process helps reveal unconventional solutions and sparks creativity by systematically examining the problem space.

Applications

Morphological Analysis is useful in product design, project planning, and innovation processes. It is widely applicable in fields like engineering, business strategy, and creative design, supporting teams in developing and evaluating novel ideas and approaches.



Exercise: "Morphological Analysis"

Participants	**Time**	**Equipment**
5–20	60–90 minutes	Large sheets of paper or whiteboard, markers

Space **:** A room with enough space for participants to work in groups around a large paper or board.

Setup

1. Prepare a large sheet of paper or whiteboard, marking columns for each variable, and provide markers and sticky notes to facilitate group work.
2. Set up materials at each table.

Instructional Steps

1. **Introduction (2 minutes)**
   - Introduce Morphological Analysis as a way to generate ideas by systematically combining different options.
2. **Define the problem (10 minutes)**
   - Clearly outline the issue or goal that the group will address.
   - Ensure all participants have a shared understanding of the challenge.
3. **Identify variables (10 minutes)**
   - Brainstorm 4–7 essential variables or parameters related to the problem.
   - Write each variable as a row heading on the paper or whiteboard.
4. **Generate options (15 minutes)**
   - For each variable, list multiple possible states or choices.
   - Encourage creativity, wide range of options and unconventional ideas.
   - Write each possible option as a column heading on the paper or whiteboard.
5. **Construct morphological box (5 minutes)**
   - Draw lines to connect the columns, forming a grid that represents all potential combinations.
6. **Explore combinations (20 minutes)**
   - Select and test different combinations across the variables.
   - Discuss the potential of each one quickly – aim for volume, not perfection.
7. **Develop solution concepts (20 Minutes)**
   - Pick 2–3 strong combinations, and turn them into clearer solution concepts.
8. **Debriefing (15 minutes)**
   - Discuss what insights were gained during the process.
   - Encourage participants to consider how this approach helped them explore new ideas.

Tips for Facilitators

Encourage participants to explore different combinations with an open mind, focusing on generating ideas rather than judging them too quickly. Promote a creative atmosphere, especially during the option-generation phase, and make sure each participant feels included in proposing ideas for all variables and combinations. Facilitate balanced participation, giving everyone a chance to contribute.

Tips for Debriefing

Create a reflective space for participants to discuss the results of Morphological Analysis and its potential applications. Use guiding questions such as the following:

- What new ideas or insights came from exploring unexpected combinations?
- Which combinations stood out or surprised you, and why?
- How can these findings inform other challenges or projects we're working on?

Summarize key points from the debrief, encouraging participants to apply this structured, combinatorial thinking approach in future problem-solving.

Variations

- *Digital mapping*: Use online whiteboard tools or spreadsheets for remote collaboration, allowing participants to fill in a shared grid and explore combinations together in real-time.
- *Time-limited combinations*: Set a timer for exploring each combination to prompt quick thinking and prevent over-analysis. This can help generate fresh ideas more spontaneously.
- *Layered approach*: Divide participants into smaller groups, each working on a subset of variables. Afterward, combine their findings to reveal a fuller range of solutions, enhancing the comprehensiveness of the analysis.

Futures Wheel

Feedback Loops | Interconnectedness | Delay | Nonlinearity | Perspectives

Purpose

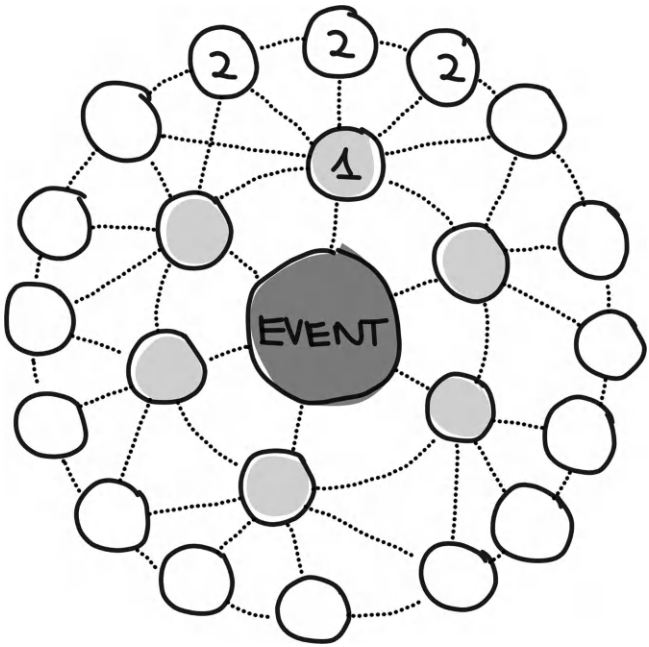
The Futures Wheel visually maps out possible ripple effects of a decision, trend, or event. Developed by Jerome C. Glenn [47], it helps participants anticipate and evaluate direct and indirect impacts by mapping first-, second-, and third-order consequences. This tool encourages strategic foresight and supports systems thinking.

How It Works

Participants brainstorm and map the first-, second-, and even third-order effects of a central topic, exploring how direct outcomes may trigger additional, less obvious consequences. This approach highlights the interconnectedness of decisions and fosters comprehensive planning.

Applications

The Futures Wheel is valuable in strategic planning, risk management, and policy analysis, where understanding long-term impacts is critical. It's used across fields such as environmental studies, organizational change, and community development, helping teams make proactive, informed decisions.



Exercise: "Futures Wheel"

Participants	Time	Equipment
6–20	1–1.5 hours	Large sheets of paper, markers (various colours)

Space **:** An open area with enough room for participants to collaborate around a large paper or whiteboard.

Setup

1. Prepare a large paper with enough space for writing and connecting ideas.
2. Place markers and sticky notes in easy reach of all participants.
3. Arrange the group in a circle with enough space to move without obstacles.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that the Futures Wheel helps map possible ripple effects of a decision, trend, or event.
   - Emphasize that the focus is on exploring possibilities, not predicting exact outcomes.
2. **Identify the central topic (10 minutes)**
   - Choose and write the main topic in the centre of the paper or whiteboard.
3. **First-order consequences (10 minutes)**
   - Brainstorm direct consequences, writing them around the central topic and connecting each to it.
   - Prompt participants to think broadly – social, economic, environmental, etc.
4. **Second-order consequences (10 minutes)**
   - For each first-order item, ask, "What might this lead to?"
   - Record the resulting second-order impacts as a second ring, linking them clearly.
   - Use colours to differentiate types of consequences, if helpful.
5. **Third-order consequences (10 minutes)**
   - Extend the process again: What are the effects of the second-order items?
   - Add a third ring, drawing out less obvious or longer-term impacts.
   - Encourage divergent thinking here; unexpected links are welcome.
6. **Debriefing (15 minutes)**
   - Facilitate a reflective discussion on the insights gained, highlighting unexpected connections and key consequences.

Tips for Facilitators

Encourage participants to think widely across different domains: social, economic, environmental, political, and technological. Remind them that not all consequences will be obvious or immediate. Use coloured markers to categorize types of impacts or timelines (short-, medium-, and long-term). Reinforce that this is a generative exercise; there are no right answers, and unlikely or even contradictory effects are worth including. Avoid letting the group fixate on evaluation too early; keep the energy on mapping possibilities. Prompt quiet participants to contribute by suggesting specific areas or perspectives to consider.

Tips for Debriefing

Initiate a reflective and open discussion. Help participants move from mapping to insight by using questions such as the following:

- What unexpected consequences did you identify?
- Which effects were overlooked at first but turned out to be significant?
- How might some of these outcomes influence one another?
- Were there any positive ripple effects you hadn't considered initially?
- How does this change the way we plan for or respond to long-term challenges?

Encourage teams to think about how mapping second- and third-order consequences could help in other contexts – especially when dealing with uncertainty, complex decisions, or cross-sector planning. Reinforce that simply seeing the web of effects is already valuable in shifting thinking.

Variations

- *Timed exploration:* Introduce time limits per layer (e.g., 5 minutes per consequence ring) to keep pace and spark quicker ideas.
- *Layered perspectives:* Assign different groups to explore impacts from specific lenses (e.g., one group maps environmental impacts, another group maps financial impacts).
- *Scenario wheel:* Build a separate Futures Wheel for each alternative scenario and compare them to identify shared risks or opportunities.
- *Reverse wheel:* Start with a possible future state, and work backward to identify what events might lead to it – useful in resilience or risk exercises.
- *Digital futures wheel:* Use tools like Miro or MURAL for remote teams to build wheels together in real time.

Manage

Evaluating and Adapting Over Time

After action comes attention. In systems work, impact isn't always immediate – or obvious. Things shift. Patterns emerge. Some effects take time to show. That's why managing means staying with the system after acting, not stepping away.

This category isn't about control. It's about noticing change and responding. Systems push back. Some actions work better than expected. Others create new problems. That's normal. The work now is to track what's happening, make sense of it, and adjust if needed.

In most projects, evaluation happens at the end. In systems, that's possibly too late. Learning has to be ongoing. These approaches help teams keep track, reflect, and stay in tune with a system that's still moving.

Methods in this section help with the following:

- Spotting signals and side effects early
- Understanding what's really changing (and why)
- Adapting actions based on feedback
- Making decisions about what to stop, scale, or redesign
- Using stories, data, and patterns to guide next steps

Some approaches focus on tracking: indicators, loops, timelines. Others centre on people: what they notice, experience, or say. Some ask tough questions: Is this working? What's emerging now? Where are we stuck?

What they share is this: managing systems change means staying engaged. Noticing is part of the work. So is pausing, stepping back, and deciding what to do next – based on what's really happening.

This isn't about checking a box. It's about responsibility. Systems change takes time, attention, and care. These methods help teams stay grounded, learn from experience, and keep the work honest – even when it's hard to measure.

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Boom and Bust

Stocks and Flows | Feedback Loops | Delays | Nonlinearity | Leverage Points

Purpose

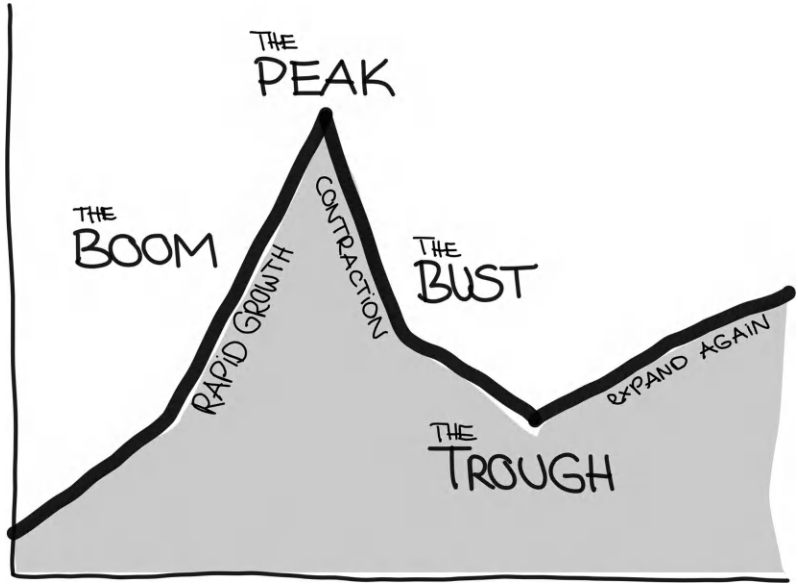
The "Boom and Bust" simulation allows participants to experience and understand the cycles of growth and collapse in resource-based systems. It demonstrates the risks of unchecked growth and resource depletion, emphasizing sustainability and long-term planning.

How It Works

Participants simulate a cycle where they draw resources, invest in growth, and face eventual scarcity and collapse. This exercise highlights how growth can lead to resource depletion and collapse, helping participants understand the importance of managing resources sustainably.

Applications

This method is ideal for educational settings, workshops on environmental sustainability, economic planning, and training sessions focused on resource management and systems thinking.



Exercise: "Boom and Bust"

Participants	Time	Equipment
5–20	1–1.5 hours	Tokens or counters, player boards, central pool for resources

Space: A room with tables for group play and a central space for the resource pool.

Setup

1. Prepare tokens or counters (e.g., coloured chips or paper clips) as resources.
2. Each participant should have a player board or space to manage resources.
3. Set up a central pool for drawing and returning resources.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of the simulation: to show how cycles of growth and collapse play out in resource-based systems.
   - Emphasize insights into sustainable (team) resource use/risks of overuse.
2. **Initial distribution (5 minutes)**
   - Distribute initial resource tokens to players and outline basic rules for drawing and using resources.
3. **Growth phase (15 minutes)**
   - Players draw resources and invest in growth, increasing their capacity for future resource collection.
4. **Peak phase (10 minutes)**
   - Players reach a prosperity peak as resources accumulate. Point out the depletion of the central pool.
5. **Warning signs (5 minutes)**
   - Introduce indicators showing resource scarcity.
   - Encourage participants to choose between continued expansion or conservation.
6. **Collapse (10 minutes)**
   - Simulate the collapse as the resource pool nears exhaustion.
   - Players return resources, experiencing rapid decline.
   - Explain the "bust" cycle and the consequences of unsustainable practices.
7. **Debriefing (15 minutes)**
   - Discuss and reflect on insights from the exercise, focusing on lessons learned about resource management and sustainable practices.

Tips for Facilitators

Ensure participants understand the rules and the significance of each phase before starting. Use clear signals to indicate transitions between the growth, peak, and collapse phases. Foster an environment that encourages strategic thinking and discussion. Remind participants that the purpose is not only to succeed individually but also to understand the system as a whole. Summarize key moments during the game to highlight patterns and behaviours. Encourage participants to think about their resource use, potential conservation strategies, and the impact of collective choices.

Tips for Debriefing

Guide the group through reflective questions that encourage analysis of their experience. Consider asking:

- What strategies worked well during the growth phase, and what didn't?
- How did warning signs affect your decisions?
- What could you have done differently to avoid the collapse?
- How can these lessons be applied to real-world resource management or teamwork?

These questions help participants recognize how their actions contributed to the outcome and reinforce the importance of sustainability and strategic planning.

Variations

- *Renewable resources:* Add renewable resources that replenish at set intervals to simulate sustainable practices.
- *Cooperative play*: Introduce an option for participants to share or trade resources to highlight collaborative strategies.
- *Random events:* Include unexpected events such as market shifts or natural disruptions to add complexity and simulate real-world unpredictability.
- *Competitive edge:* Create teams that compete for resources to explore competitive dynamics and their impact on collective sustainability.

Most Significant Change (MSC)

Perspectives | Emergence | Boundaries

Purpose

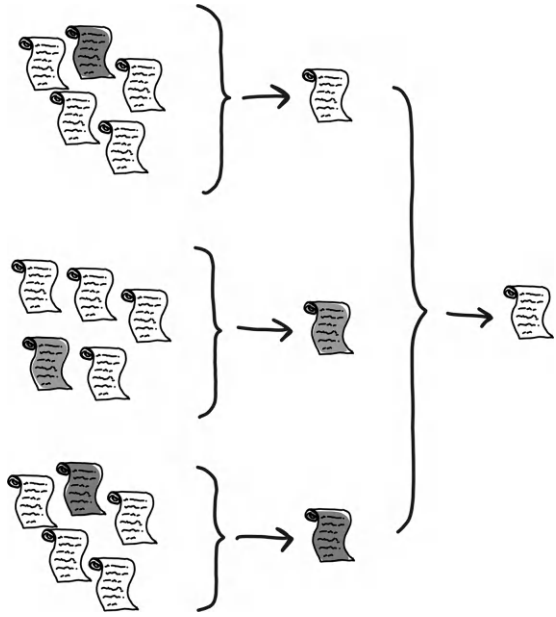
The Most Significant Change (MSC) technique helps teams learn from what matters most to the people involved. Developed by Rick Davies [104], it focuses on collecting stories of real impact – not just what was planned but also what actually changed. Instead of tracking metrics, MSC invites people to describe the biggest shifts they've seen or felt.

How It Works

MSC involves collecting and analysing stories from program participants or beneficiaries. These stories highlight the most significant changes resulting from an intervention. Stakeholders review and select stories that best represent impactful outcomes, fostering a dialogue about what is valued in the program.

Applications

MSC is ideal for evaluating programs with complex or diverse outcomes, such as community development, social services, or educational initiatives. It provides a rich understanding of how programs affect participants' lives, complementing quantitative evaluation methods.



Exercise: "Most Significant Change (MSC)"

Participants	Time	Equipment
5–20	1.5–2 hours	Paper, markers, recording devices (optional)

Space : A comfortable, quiet area conducive to storytelling and sharing.

Setup

1. Arrange the space to ensure participants feel comfortable sharing their stories.
2. Provide paper and markers for note-taking or use a recording device if permitted.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the MSC technique and its focus on capturing the most significant changes experienced by participants.
   - Emphasize the value of storytelling for qualitative evaluation.
2. **Collecting stories (20 minutes)**
   - Ask participants to share stories of significant changes they have observed or experienced, either through interviews, written submissions, or group discussions.
3. **Select stories (15 minutes)**
   - Review the stories with stakeholders or in groups.
   - Discuss and choose the most impactful stories through a transparent selection process.
   - If working in tiers, repeat selection at each level (e.g., group → community → program).
   - Document why each story was chosen.
4. **Feedback and verification (10 minutes)**
   - Share the chosen stories, and explain the selection rationale.
   - Engage participants and stakeholders in discussing what these stories reveal about significant changes.
   - Verify selected stories for accuracy to ensure the credibility of the process.
5. **Debriefing (15 minutes)**
   - Initiate reflection on the insights gained from the stories and how they influenced participants' understanding of the program's impact.
   - Encourage discussion on surprising findings, key themes, and how these insights can inform future strategies.

Tips for Facilitators

Create a comfortable, supportive environment that encourages participants to share their stories openly. Ensure that everyone understands the process and feels valued in contributing their experiences. Use guiding questions to prompt storytelling and maintain focus on significant changes. During the selection phase, promote fairness and transparency to build trust in the process. Summarize key themes as they emerge to keep the group engaged and on track. Be prepared to manage emotional stories thoughtfully and with sensitivity.

Tips for Debriefing

Encourage participants to reflect on the stories that resonated most and the insights they provided. Use questions like the following:

- What common themes emerged across the stories?
- How do these stories change your perception of the program's impact?
- What unexpected outcomes did this process reveal?

This reflection helps participants see the broader impact of their work and solidifies shared understanding.

Variations

- *Themed storytelling:* Collect stories focused on a particular aspect of the program, such as community impact or individual growth, to highlight specific areas of change.
- *Group sharing:* Have participants share their stories in small groups to encourage collaborative reflection and dialogue.
- *Digital collection:* Use online tools to gather and analyse stories, making it easier to include remote participants in the MSC process.
- *Ongoing MSC:* Implement MSC as a continuous feedback tool over the duration of a program, regularly collecting stories to track progress and adapt strategies as needed.

Outcomes Mapping

Boundaries | Perspectives | Leverage Points

Purpose

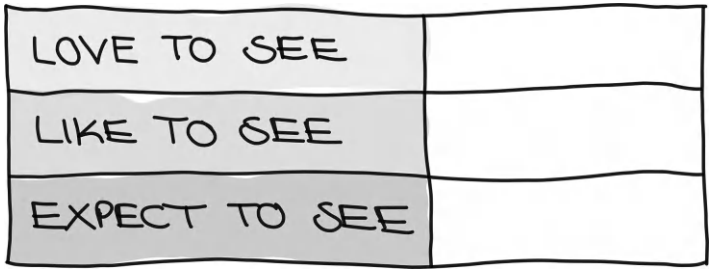
Outcomes Mapping, developed by Earl and colleagues [105], is a practical approach for tracking change in complex programs. Instead of focusing only on end results, it looks at changes in behaviour, relationships, and actions of key stakeholders the program seeks to influence.

How It Works

Outcomes Mapping involves identifying key stakeholders, known as boundary partners, and describing the changes expected in their behaviour or actions. These changes are tracked using progress markers grouped into three levels: "expect to see," "like to see," and "love to see." The method links these changes to specific strategies and activities, creating a visual map that shows how program efforts support change in others.

Applications

Outcomes Mapping is valuable for programs focused on strategic development, collaborative projects, and initiatives where tracking progress in stakeholder actions and roles is essential. It offers an adaptable approach for organizations seeking practical tools for evaluation and continuous improvement.



Exercise: "Outcomes Mapping"

Participants	Time	Equipment
5–20	1–2 hours	Large paper or whiteboard, coloured markers

Space : A collaborative room where participants can interact and contribute to the outcomes map.

Setup

1. Prepare a large paper or whiteboard, and set out coloured markers.
2. Sticky notes can be used for brainstorming or making quick adjustments to the map.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of the activity and how it tracks key changes in stakeholder actions to achieve program goals.
   - Emphasize that this method focuses on practical, flexible planning.
2. **Identify Key Stakeholders (15 minutes)**
   - List key stakeholders involved or impacted by the program.
   - Categorize and prioritize those most relevant to the program's success.
3. **Define Desired Changes (20 minutes)**
   - For each key stakeholder, describe the current state and the desired change in their role or actions.
   - Keep descriptions straightforward and avoid complex behavioural analysis.
4. **Develop Progress Markers (15 minutes)**
   - Create a set of progress markers for each desired change:
     i. "Expect to see": Initial, simple changes.
     ii. "Like to see": Signs of greater involvement or contribution.
     iii. "Love to see": More significant, impactful changes.
5. **Map Strategies and Activities (15 minutes)**
   - Identify what needs to be done to help stakeholders reach the desired change.
   - Link those actions to specific stakeholders.
6. **Create a Visual Map (10 minutes)**
   - Draw the stakeholders, progress markers, and linked strategies.
   - Arrows and layout show relationships, influences, and flow.
7. **Debriefing (15 minutes)**
   - Reflect on what the group learned from the mapping.
   - Discuss how changes align with goals and what might need adjusting.

Tips for Facilitators

Guide the mapping with clear examples and simple language. Encourage open input to capture a full view of stakeholders and desired changes. Avoid technical behavioural terms. Use visual aids to show connections and keep the map easy to follow. Summarize key points to stay aligned on objectives. Link strategies to progress markers that are practical and realistic. Create space for feedback and shared understanding.

Tips for Debriefing

Prompt participants to reflect on how the outcomes mapping process provided clarity on stakeholder roles and potential changes. Use questions such as the following:

- How do the progress markers align with our objectives?
- What unexpected insights emerged during mapping?
- What adjustments can be made to better support stakeholder engagement and program success?

These reflections help participants connect the mapping exercise to real-world program improvements and strategic planning.

Variations

- *Simplified outcomes mapping:* Focus on one or two primary stakeholders and their changes for a shorter, more targeted session. This approach is helpful for new teams or when time is limited.
- *Workshop series:* Split the mapping into multiple workshops, each focusing on different stakeholder groups or changes.
- *Collaborative mapping with stakeholders:* Involve key stakeholders directly in the mapping process to gain first-hand insights and build buy-in.
- *Progressive mapping:* Revisit and update the outcomes map regularly as the program evolves, making it an ongoing tool for adaptive management and continuous learning.

Note

This is a simplified version of Outcomes Mapping, adapted for practical use in workshops and planning sessions. It focuses on the core elements: stakeholder behaviour, desired change, and linked strategies. The full methodology includes 12 steps, covering organizational practices, monitoring tools, and evaluation planning. For more, see the original work by Earl, Carden, and Smutylo [105].

Lag vs. Lead Indicator Tracking

Perspectives | Leverage Points | Interconnectedness

Purpose

Lag vs. Lead Indicator Tracking, developed by Kaplan and Norton [106], helps teams focus on what they can act on early. It separates what shows up after the fact (lag indicators) from early signs that change is coming (lead indicators). This helps teams track progress, adjust faster, and avoid reacting too late.

How It Works

Participants identify key performance areas, then brainstorm both lag and lead indicators for each. By tracking both types, teams can assess how current efforts are shaping future results – and adjust earlier if needed.

Applications

This method is useful for strategic planning, evaluation, risk management, and performance improvement. It supports proactive decision-making and helps teams avoid relying solely on late-stage outcomes.

Exercise: "Lag vs. Lead Indicator Tracking"

Participants	**Time**	**Equipment**
4–20	45–90 minutes	Whiteboard or large paper, markers, sticky notes

Space **:** A workspace with enough room to map indicators visibly.

Setup

1. Choose one or more goals, outcomes, or key focus areas (e.g., learning outcomes, client satisfaction, sustainability).
2. Prepare columns or two separate areas for "lead indicators" and "lag indicators."
3. Provide sticky notes or markers for group input.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the difference between lead indicators (predictive, early signs) and lag indicators (outcomes, results).
   - Emphasize the benefit of tracking both to stay ahead of problems.
2. **Identify lag indicators (10 minutes)**
   - Ask: "How do we usually know if we've succeeded or failed?"
   - List the most common results or performance metrics; these are lagging.
3. **Identify lead indicators (10 minutes)**
   - For each lag indicator, ask: "What might signal progress or problems earlier?"
   - Brainstorm and list predictive inputs or behaviours – things that happen before the outcome.
4. **Categorize and connect (10 minutes)**
   - Group lead indicators under each lag indicator.
   - Draw arrows or lines to show cause-effect logic (if useful).
5. **Prioritize and apply (10 minutes)**
   - Identify 2–3 lead indicators the group could start tracking immediately.
   - Discuss how they could inform action or decision-making.
6. **Debriefing (15 minutes)**
   - Reflect on the differences between tracking outcomes and early signals.
   - Summarize where lead indicators could prevent problems or reveal opportunities earlier.

Tips for Facilitators

Start with familiar ground: ask participants how they currently know if a project is working or not. This helps frame the difference between reactive and proactive tracking. Encourage them to think in cause-and-effect terms: What happens before a success or failure becomes visible? Don't push for perfection; lead indicators are about early signals, not certainty. Emphasize practicality: it's better to track a few useful leads than aim for theoretical coverage. Highlight the value of early feedback for adjusting strategy, not just monitoring.

Tips for Debriefing

Help participants reflect on how their thinking shifted during the exercise.

Ask:

- Which indicators gave us early insight we weren't using before?
- Did any lag indicators feel too late to be useful?
- How might early tracking change how we act or prioritize?

Encourage them to take one idea forward into their work: a new indicator, a shift in timing, or a conversation with others about what counts as "progress." Reinforce that the goal is not just to monitor outcomes but also to shape them – earlier, more effectively, and with better information.

Variations

- *Single goal focus:* Narrow the scope to one key outcome for clearer connections between lead and lag indicators.
- *Data audit:* Review what indicators the team already tracks – then identify gaps or areas where earlier signals would help.
- *Visual timeline:* Lay out a rough timeline for a project or initiative, and place each indicator where it typically appears.
- *Team role lens:* Break into role-based groups (e.g., operations, leadership, comms), and map indicators from each perspective.
- *Remote version:* Use collaborative tools like Miro or Mural to sort, label, and connect indicators virtually, especially useful across teams or time zones.

Balanced Scorecard

Perspectives | Leverage Points | Interconnectedness

Purpose

The Balanced Scorecard, developed by Kaplan and Norton [106], is a strategic planning and management tool. It helps organizations align activities with their vision and strategy by measuring performance across key perspectives. The approach ensures that goals are connected and support broader objectives.

How It Works

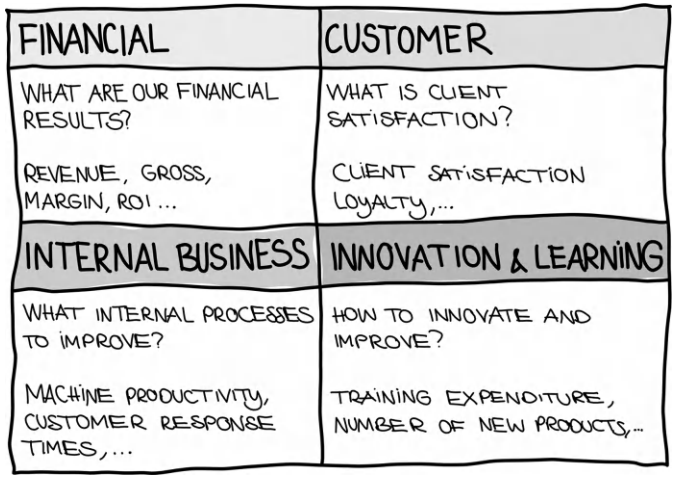
The Balanced Scorecard breaks down strategic goals into four main perspectives. For each, teams define key performance indicators (KPIs), set targets, and identify initiatives. Use a simple 2 × 2 grid:

- *Top left:* Financial – How do we look to shareholders?
- *Top right:* Customer – How do customers see us?
- *Bottom left:* Internal Processes – What must we excel at?
- *Bottom right:* Learning and Growth – Can we keep improving and creating value?

This layout makes it easier to list KPIs, targets, and actions clearly. Arrows can be added later to show how goals connect, creating a simple strategy map.

Applications

This method helps organizations align operations with strategic goals. It ensures teams work toward shared objectives and provides a structured way to track success and improve.



Exercise: "Balanced Scorecard"

Participants	Time	Equipment
5–15	1.5–2 hours	Paper, markers, or digital tools for visualization

Space : A room suitable for collaborative discussion and planning.

Setup

1. Collect paper, markers, or digital tools to visualise the scorecard.
2. Ensure that the room layout facilitates group interaction and brainstorming.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain how the Balanced Scorecard links actions to strategic goals.
   - Emphasize the value of using multiple perspectives for planning.
2. **Define perspectives (12 minutes)**
   - Introduce the four key perspectives: Financial, Customer, Internal Business Processes, Learning and Growth
   - Ask participants to draw a 2 × 2 grid with one box for each perspective. This grid will be used to organize KPIs, targets, and actions in the next steps.
3. **Develop key performance indicators (20 minutes)**
   - Brainstorm and create KPIs for each perspective that align with the strategic objectives. Examples include the following:
     i. Financial: Revenue growth, ROI, profit margins.
     ii. Customer: Satisfaction scores, retention rates.
     iii. Internal Processes: Efficiency metrics, innovation rate.
     iv. Learning and Growth: Employee training hours, technology adoption.
4. **Set targets (15 minutes)**
   - For each KPI, set measurable targets that align with the strategic objectives.
5. **Identify initiatives (15 minutes)**
   - List the specific actions required to meet the targets for each KPI.
6. **Create a strategy map (15 minutes)**
   - Draw a visual map showing how objectives across perspectives connect and support the overall strategy.
7. **Implement and monitor (10 minutes)**
   - Start using the scorecard to track progress and guide action.
   - Adjust the strategy as needed based on results and changing conditions.
8. **Debriefing (15 minutes)**
   - Reflect on the process and how KPIs and actions align with strategic goals. Identify any needed adjustments.

Tips for Facilitators

Guide participants through the process with clear explanations and relatable examples to build understanding. Encourage open discussions and collaborative input to develop KPIs that align with strategic objectives. Ask probing questions to prompt deeper thinking about what truly measures success within each perspective. Use visual aids to illustrate connections between objectives and KPIs clearly. Summarize key takeaways during the session to maintain focus on aligning activities with broader goals. Highlight the importance of creating realistic and actionable initiatives tied to each KPI. Foster a supportive environment where all ideas are welcomed and considered, promoting a collaborative atmosphere for strategy development.

Tips for Debriefing

Initiate reflection by asking participants to consider how the Balanced Scorecard process highlighted the interconnected nature of strategic objectives. Use questions like the following:

- How do the developed KPIs align with our long-term goals?
- What surprised you about the connections between different perspectives?
- What potential obstacles might we face when implementing these initiatives?

Encourage participants to think about how they can use the Balanced Scorecard to track ongoing progress and adapt as needed. This reflection helps solidify the learning experience and emphasizes the importance of continual review and adjustment.

Variations

- *Simplified balanced scorecard:* Focus on one or two perspectives for initial practice, easing teams into the method.
- *Department-specific scorecards:* Customize scorecards for different departments to align specific goals with the overall strategy.
- *Workshop series:* Break down the process into multiple sessions, each focusing on one perspective for thorough exploration.
- *Digital tools:* Use software like Power BI or other project management tools for real-time tracking and updates, beneficial for remote teams.
- *Feedback-integrated scorecard:* Include regular review points to integrate new insights and ensure alignment with strategic changes.

Iceberg Model

Delays | Boundaries | Perspectives | Leverage Points

Purpose

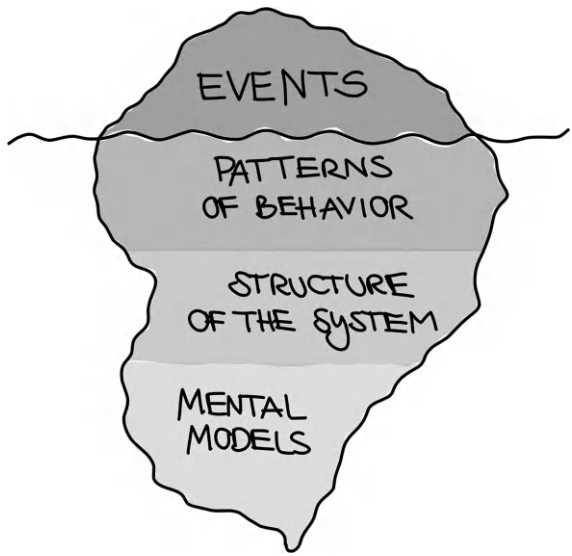
The Iceberg Model is a visual metaphor used in systems thinking, inspired by Peter Senge's work [52]. It helps participants analyse complex issues by moving beyond surface-level symptoms to uncover deeper, systemic causes. The model supports longer-term solutions by showing how patterns, structures, and mindsets shape what's visible on the surface.

How It Works

Participants create a visual representation of an iceberg, with visible problems listed above the waterline and deeper causes explored below. This structure helps identify root causes and analyse the connections between different levels of a system.

Applications

The Iceberg Model is useful in organizational problem-solving, strategic planning, educational workshops, and any context where addressing root causes rather than symptoms is key. It also works well before deeper mapping or evaluation, helping teams surface patterns or beliefs to explore with tools like Causal Loop Diagrams (CLD) or Fuzzy Cognitive Mapping (FCM).



Exercise: "Iceberg Model"

Participants	**Time**	**Equipment**
5–15	45 minutes–1 hour	Large paper or whiteboard, markers (various colours), sticky notes (optional)

Space **:** A room with wall space for visual display and group discussion.

Setup

1. Prepare a large sheet of paper or whiteboard and set out markers.
2. Sticky notes can be used to facilitate brainstorming.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the Iceberg Model's purpose and how it reveals root causes beneath visible symptoms.
2. **Draw the Iceberg (5 minutes)**
   - Sketch a large triangle on the paper or whiteboard, adding a line across the middle to represent the waterline.
3. **Identify events (5 minutes)**
   - Above the waterline, list key events or symptoms that are currently visible (e.g., missed deadlines, high turnover, public complaints).
4. **Explore deeper causes (15 minutes)**
   - Guide participants to identify deeper causes below the waterline:
     i. *Patterns of Behaviour* – Trends or repeated actions over time.
     ii. *Structures* – Policies, workflows, incentives, or organizational norms.
     iii. *Mental Models* – Assumptions, beliefs, or values that shape the system.
5. **Connect the levels (5 minutes)**
   - Draw arrows to illustrate how deeper causes influence the levels above.
6. **Analyse and discuss (10 minutes)**
   - Discuss how addressing deeper causes could change the visible symptoms.
7. **Debriefing (15 minutes)**
   - Initiate reflection on the insights gained during the exercise and how these findings changed participants' understanding of the problem.
   - Encourage discussion on the most surprising discoveries, identified leverage points, and how addressing these deeper causes could lead to more effective solutions.

Tips for Facilitators

Encourage participants to share diverse perspectives when exploring deeper causes, as this enriches the analysis. Use colour-coded markers and clear visuals to illustrate the different levels and their connections. Summarize key takeaways throughout the process to keep the group focused and engaged. Remind participants that uncovering deep-rooted assumptions or beliefs can be challenging but is crucial for meaningful insights. Foster an open environment where participants feel comfortable questioning established views and contributing freely.

Tips for Debriefing

Guide participants to reflect on the insights gained from uncovering root causes and how their understanding of the problem evolved. Prompt discussion with questions like the following:

- Which underlying causes were most surprising?
- How could addressing these deeper causes change the current situation?
- What obstacles might you face in tackling these issues?

This reflection reinforces the importance of going beyond surface-level problem-solving to create sustainable change.

Variations

- *Quick iceberg:* Limit the focus to visible symptoms and one deeper layer for a shorter session that still provides valuable insights.
- *Collaborative iceberg:* Split participants into smaller groups to create different iceberg models, then compare and discuss findings to gather a range of perspectives.
- *Themed iceberg:* Focus on one domain (e.g., equity, sustainability, leadership) for deeper analysis in one area.
- *Digital version:* Use online tools for virtual sessions, enabling remote participants to contribute and collaborate in real time.

Note

There might be different interpretations of the Iceberg Model, which all typically follow an interpretation of Senge's work [52].

Scenario Stress Testing

Delays | Boundaries | Perspectives | Leverage Points

Purpose

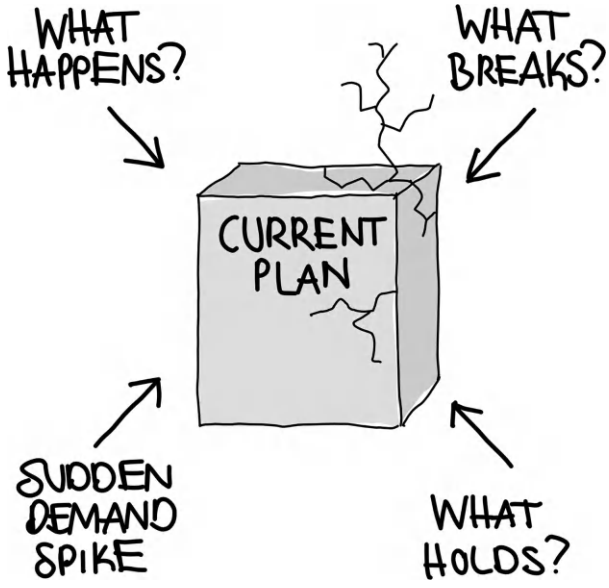
Scenario Stress Testing helps teams assess how robust their plans, systems, or strategies are under uncertain and high-pressure conditions. It highlights weak spots and prepares participants to adapt when facing disruption, pressure, or sudden change.

How It Works

Participants define a current plan or system and test it against a range of hypothetical but realistic stress scenarios. These may include sudden shifts in demand, budget cuts, stakeholder backlash, or environmental changes. The group explores how their system responds, what breaks down, and what holds up.

Applications

This method is useful in strategic planning, risk management, crisis preparedness, and innovation work. It helps teams improve resilience by identifying hidden vulnerabilities before real-world stress hits. It also supports adaptive thinking by encouraging teams to explore "what-if" situations in advance.



Exercise: "Scenario Stress Testing"

Participants	Time	Equipment
5–15	1 hour–1.5 hours	Paper or whiteboard, markers, pre-written scenario cards (optional)

Space: A room with open space for discussion and collaboration.

Setup

1. Choose a plan, policy, project, or process to test.
2. Prepare a list of potential stress scenarios (or have participants generate them).
3. Make space to map system responses and note breakdown points.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the goal: to test how resilient a system or plan is under pressure.
   - Emphasize that the goal isn't to predict the future but to be ready for disruption.
2. **Describe the system or plan (10 minutes)**
   - Briefly outline the current strategy, plan, or setup under review.
   - Clarify key objectives, assumptions, and expected conditions.
3. **Introduce stress scenarios (10 minutes)**
   - Present 2–3 challenging scenarios (or invite the group to generate them).
   - Examples: sudden loss of funding, public criticism, system overload, loss of a key partner.
4. **Simulate and observe (20 minutes)**
   - For each scenario, ask: What happens? What breaks? What still works?
   - Note reactions, ripple effects, and possible failure points.
   - Map out the chain of events triggered by the stressor.
5. **Identify gaps and leverage points (15 minutes)**
   - Discuss how the system could be improved to handle stress better.
   - Note what assumptions no longer hold and what actions could increase resilience.
6. **Debriefing (15 minutes)**
   - Reflect on what surprised the group.
   - Discuss how stress testing changed their view of the plan and exposed new needs.

Tips for Facilitators

Encourage participants to stay constructive, not pessimistic. Remind them this is about preparation, not fear. Frame the exercise around learning – not proving a plan right or wrong. If the group hesitates, start with mild scenarios, then move toward more extreme ones. Track both technical and human responses (e.g., emotional, team-based, reputational). Help teams distinguish between flexible parts of the system and rigid ones.

Tips for Debriefing

Ask participants to reflect on how their confidence in the original plan shifted. Guide them with questions like the following:

- What failed that we didn't expect?
- Which assumptions no longer hold under pressure?
- What adjustments are now obvious that weren't before?

Use this moment to shift from defending the current system to thinking in terms of adaptation, redundancy, and preparedness.

Variations

- *Rapid round: Run through 3–5 quick-fire scenarios to spot immediate weak spots.*
- *Role-based stress: Assign participants stakeholder roles, and explore how each responds to stress.*
- *Sector-specific stress: Use scenarios specific to healthcare, education, policy, etc., for more tailored insights.*
- *Future framing: Stress test not today's plan but the next one – something currently in early development.*
- *Digital version: Use collaborative whiteboards to list responses and reactions in remote settings.*

Fuzzy Cognitive Mapping (FCM)

Interconnectedness | Feedback Loops | Nonlinearity | Perspectives | Leverage Points

Purpose

Fuzzy Cognitive Mapping (FCM), originally developed by Bart Kosko [107], is a semi-quantitative method for visualizing and analysing causal relationships in complex systems. It helps users explore interconnections, assess influence, and test how changes might affect system behaviour. Its key feature is assigning weights to each connection, combining structured mapping with simple simulation.

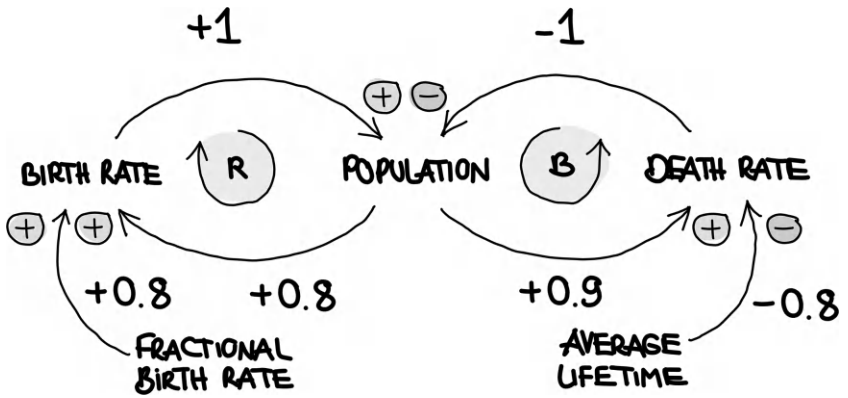
How It Works

FCM is like a causal loop diagram with weighted links. Participants draw system elements as nodes and connect them with arrows to show cause-effect relationships. Each arrow gets a weight (from −1 to +1) showing the direction and strength of influence.

This makes FCM a semi-quantitative method – combining qualitative structure with basic numbers to estimate how one part of the system may affect others. It supports identifying feedback loops, testing scenarios, and exploring likely system responses.

Applications

FCM is useful in fields such as environmental management, business strategy, medical diagnostics, and social science. It's a flexible tool that incorporates both qualitative and quantitative data, making it ideal for analysing systems with uncertainty and complexity.



Exercise: "Fuzzy Cognitive Mapping (FCM)"

Participants	**Time**	**Equipment**
5–20	1.5–2 hours	Paper, coloured markers, optional FCM software tools (e.g., Mental Modeler)

Space : A workspace with wall space or tables for creating and displaying maps.

Setup

1. Prepare paper, markers, or use FCM software tools for creating maps.
2. Ensure participants have enough space for drawing connections between system components.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain that FCM shows causal relationships between system components.
   - Mention that FCM is similar to a *Causal Loop Diagram (CLD)* but adds weights to show the strength and direction of influence.
   - Emphasize its utility in understanding and simulating complex systems.
2. **Identify key concepts (15 minutes)**
   - Brainstorm and list all relevant variables or components in the system.
   - Ensure clarity in the definition of each concept to avoid ambiguity.
3. **Draw concepts (10 minutes)**
   - Represent each variable as a node on the paper or software tool.
   - Arrange them for clear visibility and logical flow.
4. **Establish connection (15 minutes)**
   - Draw arrows between related concepts to indicate causal relationships.
   - Discuss the relationships and ensure consensus on key connections.
5. **Assign weights (15 minutes)**
   - Assign weights to each connection, using values between −1 and 1 to show the strength and type of influence:
     i. *Positive values* indicate an increase in one increases the other.
     ii. *Negative values* indicate an increase in one decreases the other.
     iii. *The magnitude* reflects the strength of the influence.
6. **Debriefing (15 minutes)**
   - Initiate reflection on the process, system behaviour, and insights into causal relationships and decisions.

Tips for Facilitators

Start with a simple map, and add complexity gradually. Make sure all concepts are clearly defined. Encourage participants to share their insights, and use real data or expert input where possible. When assigning weights, support group discussion to improve accuracy. Use visual aids to keep the session engaging and highlight key connections. Summarize progress regularly so everyone stays focused and understands how their input shapes the map.

Tips for Debriefing

Prompt participants to reflect on how the mapping exercise provided new insights into system behaviour. Ask questions such as the following:

- Which connections or feedback loops were unexpected?
- How might these relationships inform future strategies or decision-making?
- What additional information could enhance the accuracy and utility of this map?

These reflections help deepen understanding and identify areas for further refinement or future exploration.

Variations

- *Simplified FCM:* Start with a smaller number of key components and simple relationships for beginners or shorter sessions.
- *Digital FCM:* Use specialized software, like Mental Modeler or FCMapper, to create and analyse more complex maps, ideal for remote or tech-savvy teams.
- *Collaborative mapping:* Divide participants into subgroups to map different parts of the system, then combine the sections for a comprehensive view.
- *Scenario simulations:* Apply "what-if" scenarios to the completed map to assess how potential changes impact the system.
- *Layered analysis:* Develop separate maps for different types of influences (e.g., economic, environmental, social), and integrate them for a multi-dimensional perspective.

Note

FCM may seem quite similar to Causal Loop Diagrams (CLD), but FCMs assign a numerical weight to each causal link, allowing for semi-quantitative analysis and simulation, while CLDs typically only show the direction of influence for qualitative understanding.

Critical Systems Heuristics (CSH)

Boundaries | Perspectives | Leverage Points

Purpose

Critical Systems Heuristics (CSH) is a framework by Werner Ulrich [22] to examine the ethical assumptions in a system through 12 boundary questions. It encourages reflection on benefits, exclusion, and moral choices.

How It Works

Participants answer 12 structured questions in two modes ("is" and "ought"):

Sources of Motivation

- Who is (ought to be) the client?
- What is (ought to be) the purpose?
- What is (ought to be) the measure of improvement?

Sources of Control

- Who is (ought to be) the decision-maker?
- What resources are (ought to be) controlled by the decision-maker?
- What conditions are (ought to be) part of the decision environment?

Sources of Knowledge

- Who is (ought to be) considered an expert?
- What expertise is (ought to be) consulted?
- What or who is (ought to be) the guarantor of success?

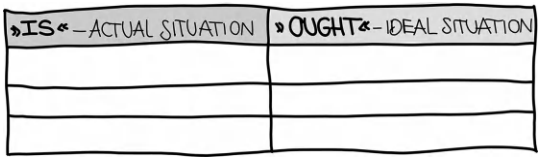
Sources of Legitimacy

- Who is (ought to be) the voice for those affected but not involved?
- What secures (ought to secure) emancipation from the system's assumptions?
- What worldview is (ought to be) shaping the system?

This produces 24 answers that reveal blind spots and ethical gaps. They're usually shown in a two-column table with each question and its two responses.

Applications

CSH is effective in project management, policy, and social programs where ethics and diverse perspectives matter.



Exercise: "Critical Systems Heuristics"

Participants	Time	Equipment
5–15	1–1.5 hours	Paper, markers

Space: A room conducive to group discussions and brainstorming.

Setup

1. Ensure the space is equipped with paper and markers for participants to note down responses and visualize system boundaries.

Instructional Steps

1. **Introduction (2 minutes)**
   - Explain the purpose of CSH and its use in exploring the ethical dimensions of systems.
   - Emphasize the importance of understanding who benefits from and who is excluded from the system.
2. **Ask the 12 Boundary Questions (30 minutes)**
   - Guide participants through the 12 boundary questions, grouped into four categories:
     i. *Sources of Motivation*
     ii. *Sources of Power*
     iii. *Sources of Knowledge*
     iv. *Sources of Legitimacy*
3. **Compare "actual" and "ideal" modes (20 minutes)**
   - Ask participants to answer each question for both the "actual" system and an "ideal" state.
   - Highlight any gaps or ethical issues that arise.
4. **Facilitate dialogue (20 minutes)**
   - Encourage a discussion on the identified gaps and their implications.
   - Engage participants in considering how these insights could influence system changes or decision-making processes.
5. **Review and debriefing (15 minutes)**
   - Review the main findings and reflect on how CSH helped uncover hidden assumptions and value judgments.
   - Discuss how these insights can inform more ethical, inclusive, and effective system designs.

Tips for Facilitators

Ensure participants understand the purpose behind each boundary question and encourage open-mindedness throughout the exercise. Create an environment where all perspectives are valued and considered. Periodically summarize discussions to keep the focus on ethical implications and system boundaries, ensuring that everyone stays aligned and engaged.

Tips for Debriefing

Prompt participants to reflect on the exercise by considering questions such as the following:

- Which boundary questions led to the most surprising insights, and why?
- How did comparing "is" and "ought" responses change their understanding of the system's ethical boundaries?
- What potential changes or strategies could address the identified gaps and improve system design?

Encourage participants to share their thoughts on how these insights could be applied to future projects or decisions. Facilitate a discussion that connects the reflections to real-world implications, reinforcing the importance of considering ethical and boundary-related factors in decision-making. This helps ensure that participants leave with actionable takeaways and a better understanding of how to incorporate these considerations into ongoing work.

Variations

- *Simplified CSH:* Use a selection of the 12 questions to simplify the exercise for beginners.
- *Collaborative CSH workshop:* Divide participants into smaller groups to address different boundary questions, and share their findings for collective learning.
- *Case study CSH:* Apply the boundary questions to a real-world example for hands-on practice and deeper understanding.
- *Digital CSH:* Leverage online tools for remote teams to explore and visualize boundary questions together.
- *Ongoing reflection:* Revisit the CSH process periodically to ensure boundary considerations remain up-to-date and relevant as the system evolve

Final Thoughts

The development of this book has been an intense and rewarding experience. Bringing together these ideas, methods, and perspectives challenged me as much as I hope it challenges you, not with answers but with better questions.

I believe there's no single path into systems thinking. It's not about mastering a fixed set of tools or sticking to one school of thought. It's about staying curious, paying attention to patterns, and learning to appreciate multiple perspectives. That takes practice, openness, and often, some discomfort.

This book is an invitation to step into that space, to explore, to test, to reflect, and to act. Use what's here. Adapt what works. Question what doesn't. The real value lies not in following a method by the book but in using it to see more clearly, work thoughtfully, and respond to what the situation seems to need, from your or another perspective at that time, whether that's change, stability, or something in between.

I'm grateful for the many conversations, encouragements, and critiques that shaped this work. The field of systems practice is wide, and it grows through exchange. My hope is that this book supports you as part of that.

Keep exploring. Keep asking. Keep learning.

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